The

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# The Central Electricity Board.

THE switching in at full pressure of the first 20 miles of the Central Electricity Board's "grid" transmission overhead line system last week marked one more milestone on the road of electrical progress, for it is the first instance of the electrical transmission of power in Great Britain at a working pressure of 132,000 volts.

The section referred to is part of the Central Scotland scheme, between the Dalmarnock sub-station, Glasgow, and Bonnybridge. Another short section of line, forming part of the South-East England scheme, between Bedford and Little Barford, was also made alive last week, but has been commissioned at 33 kV temporarily; that voltage will, however, be raised to 132 kV so soon as the scheme has been completed. It is probably generally known that in framing the district schemes the Electricity Commissioners' choice of 132 kV was influenced to some extent by the possibility that in due time short lengths of underground cable might be deemed to be of sufficient reliability in service at that working pressure where circumstances might warrant the heavy additional capital expenditure that their use would involve. That the choice was a wise one from the economic aspect was conceded at the time it was made, but it was not expected that the hope that underground cables might be used at that pressure in the near future would be fulfilled quite so soon as it apparently will be. Optimism has, however, been justified and we may expect to see such cables being laid in the metropolitan area before very long.

Most appropriately, the inauguration of the first portion of the "grid" coincided with the publication of the Central Electricity Board's first annual report, which is dealt with on another page. It details the accomplishments achieved during one and three-quarter years of the two years that the Board has been in existence. Largely descriptive of the system and methods adopted, it is, notwithstanding I.E.E. papers on the same subject, highly interesting, for the progress of the work undertaken by the Board has been materially more

rapid than its magnitude allowed one to hope for initially. A substantial share of the credit for this satisfactory state of affairs is rightly attributed to the electrical consultants who carried out preliminary investigations on behalf of the Electricity Commission, and by appointing them to serve as the Board's consultants also the latter has shown its appreciation of their accumulated information and at the same time avoided the collection of a large technical staff to deal afresh with matters that had already been investigated. The preliminary work lightened the Board's task considerably and enabled it to place contracts at an early date, but some of the contractors have, we fear, not been able to keep to their completion dates.

Representations from statutory undertakers and other interested parties have been mainly of the nature of suggestions relative to the practical working out of the schemes rather than criticism of their general provisions, and it is highly satisfactory to be able to record the fact that resort to formal inquiry or arbitration has not been necessary. So far, moreover, it has only been necessary in two cases to apply to the Minister of Transport for compulsory wayleaves (two towers in Scotland and three in south-east England).

That there is considerable scope for the structural designer in connection with the determination of the most suitable form of overhead-line supports will be generally agreed, and it is interesting to learn that although the majority of the towers will be of lattice-steel construction, reinforced-concrete and wood poles are also being used on some sections of the secondary system. Rustless steels are at present considered to be too expensive to allow of their use in tower construction. The most vulnerable component of high-voltage transformers being their terminal insulators, it has been decided to put both the oil-filled and condenser types to the test of practical use. The latter kind has hitherto had to be largely imported, and it is accordingly gratifying to know that satisfactory insulators of this design of British manufacture are now obtainable. Space is being provided at each sub-station for the building of repair sheds, but they are not to be erected until experience dictates the necessity, which decision is contrary to current practice abroad, but it was formed after consultation with the principal transformer makers. Again, it has not been deemed expedient to restrict development by specifying any one of the several methods of voltage regulation favoured by individual manufacturers, which differ in detail. Such instances are examples of the general desire to ascertain by the severest test of practical use the most trustworthy equipment.

Voltage regulation, the metering of interchanged energy, and control of the system, or load dispatching, are likely to be the major operational problems to be solved. There is not much doubt that the " grid " lines will function with a reasonable measure of safety without the need for any elaborate system of protection; in this country the provision of lightning arrestors would be a luxury of doubtful utility, and it seems that most of the high-voltage overhead-line trouble experienced in the British Isles has resulted from the deposition upon the insulators of fouling matter carried by wind and rain. Thus, attention needs to be devoted to insulator design with due respect to field form and equipotential surfaces, as recently outlined in an I.E.E. paper on the subject.

One point is worthy of notice: while most of the equipment is touched upon in the report, there is a total absence of any reference whatever to the switchgear. In recent I.E.E. papers on the Board's work similar reticence was exercised, and it may therefore be assumed that definite experience under working conditions is desired before any statement is made. It is claimed to be feasible to calculate the rupturing capacity of a given circuit breaker with sufficient confidence to allow of upward extrapolation within moderate limits. Such an assumption requires proof and may be dangerous, particularly as to-day the conception of large-capacity circuit breakers implies gear capable of rupturing short-circuit power loads of over 1,000,000 kVA, and one cannot afford to class it in the same category as fuses, to be replaced after it has been called upon to function once, and once only.

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**The " Associated " Meeting.**

The first annual meeting of Associated Electrical Industries, Ltd., since it changed its name and functions, is an event of outstanding importance, and in the report of Mr. Levis's speech, which appears in this issue, there are many points which indicate the policy of the group and are therefore deserving of particular attention.

In the first place, it is interesting to learn that the company's old title—Metropolitan-Vickers Electrical Co., Ltd.—is to be taken by the subsidiary which, originally " Metro-Vick Supplies, Ltd., was to have been called " Metro-Vick Electrical Products, Ltd." Thus the net result of the arrangements appears to be that the new Metropolitan-Vickers Electrical Co., Ltd., will carry on the business of the old company of the same name, plus that of the selling concern—Metro-Vick Supplies, Ltd., leaving Associated Electrical Industries, Ltd., to act purely as a holding company.

It is very reassuring to hear from Mr. Levis that the policy of the companies of the group will be to continue manufacturing in this country practically everything that they supply. This should eventually lead to the employment of far more than the 30,000 people to whom the companies already give work.

The chairman pointed out, as many other chairmen of electrical manufacturing companies have done, that the profits earned by the industry are incommensurate with the capital invested and work carried out. He said that the low prices prevailing were not entirely due to foreign competition; in many cases they were attributable to competition between English firms. This pointed to the advisability of every effort being made by those in control of the industry in England to secure co-operative arrangements which would tend to produce an adequate return for the investment of money and brains in the industry.

The object of the " Associated " merger was to co-ordinate production, selling, research, and purchasing and to economise efforts in many other directions. In Mr. Levis's opinion the merger " can be regarded only as the beginning of what should be done if the electrical industry in England is to develop successfully and be in a position to render adequate service in this country, and, in addition, to bring to Great Britain its proper share of world business in competition with other countries."

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**Financial Developments in the Supply Industry.**

Further steps towards the grouping of electricity supply companies were announced last week. The first was the proposal by the British Power and Light Corporation, Ltd., to issue £1,600,000 in ordinary shares in this country (the offer actually being made on Monday last) and a similar amount in the United States. The principal acquisition of the company will be the North Wales Power Co. and its associated Distribution Company, but it is also purchasing the share capital of five smaller concerns in various parts of the country. The directors of the Corporation include Messrs. G. W. Partridge and G. V. Twiss.

In the second place, the Greater London & Counties Trust, Ltd., has made an offer to the " A " and " B " shareholders of the Shropshire, Worcester & Staffordshire Electric Power Co. which, if accepted, will give the Trust control of the company. In the Shropshire Co.'s last report it was mentioned that arrangements had been made for the interchange of supplies with the Wessex Electricity Co. As the latter is controlled by the Trust the purchase of the Shropshire Co.'s shares will no doubt bring about a physical as well as a financial interlinking of the two important undertakings which between them cover a very extensive area of the country, mainly of a rural character.

# The Leningrad Sub-station.

**Some particulars concerning the equipment of the step-down transformer station of the Volchov hydro-electric undertaking.**

By C. J. WEBB, A.I.A.E.

IN a recent issue of the ELECTRICAL REVIEW (February 22nd, p. 320), a full description is given of the 80,000-h.p. hydro-electric station which has been established on the Volchov River for the supply of power to the city of Leningrad, about 83 miles away. We are now able to give some particulars of the main transformer station in Leningrad, fig. 1, which is designed to receive power from the Volchov station through two 120-kV transmission lines, and to step-down the pressure to 35 kV by means of two indoor-type transformers. As a stand-by a third identical transformer is provided, this being so arranged with respect to the 120-kV bus-bar system that by means of two electrically-operated section switches it can easily be connected to either of the two lines. The normal input of the sub-station is about 70,000 kVA. There is no excess-voltage protection, except that the neutral points of the transformers in the generating station are earthed, and the high-pressure neutrals of the step-down transformers in the sub-station are earthed through pressure transformers. The object of the latter is partly to release the line of oil switches on the occurrence of an earth fault, and partly for the purpose of giving a signal to the switchboard attendants.

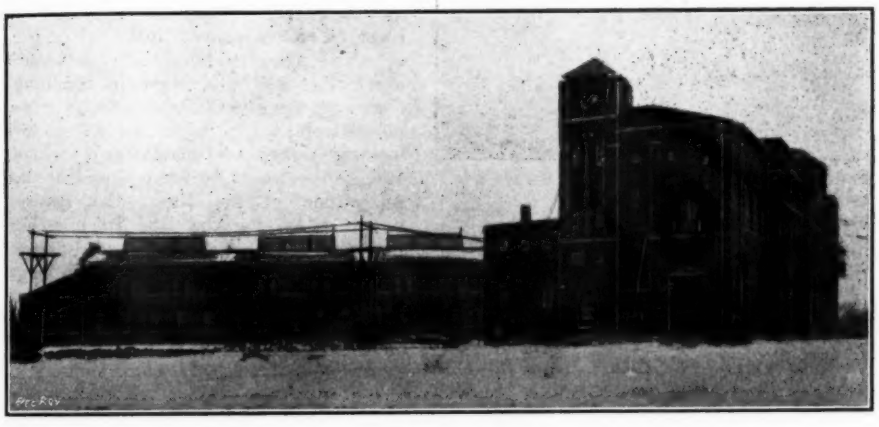


**Fig. 1.—The Leningrad Sub-station; Snow-covered Ground.**

Energy at 35 kV is transmitted to a duplicate bus-bar system, one half being kept as a stand-by. The system has been arranged so that parallel working between the two transformers can be effected through two sets of reactance coils, whether the normal transformers or the stand-by transformer is in operation. From the 35-kV bus-bar system power is distributed through cables to different load centres in the Leningrad district, arranged on a ring main, where the pressure is further transformed down to 6.3 kV. From the 35-kV bus-bars power is taken to a tertiary station housed in the main sub-station, where the pressure is also stepped down by two indoor transformers to 6.3 kV. On the 6.3-kV system there are five outgoing feeder cables and two circuits to local transformers for the requirements of the sub-station itself. The tertiary system is sectioned by means of oil switches and is normally divided for working into two groups, although the possibility of parallel running exists if the load requirements of the station should demand it. By means of the local transformer power is transformed down for the station requirements to the most suitable voltage, in this case 220 V.

There is also an arrangement for the supply of d.c. for local requirements, two 22-kW, 250-V motor-generators and accumulators being installed. For emergency lighting purposes there are three automatic lighting change-over switches which, in the case of a breakdown of the a.c. system, automatically connect the d.c. system to the lighting circuits, automatically returning to their original position when the a.c. voltage is restored.

One wing of the building is used for the 120-kV equipment, fig. 2, while the other contains the 35-kV, 6.3-kV and 220-V apparatus, the control room, local equipment, &c., being located in the central portion. For earthing the 120-kV incoming lines when any work is to be carried out on them, "disconnecting" switches are placed immediately under the leading-in bushings. The main 120-kV oil switches, fig. 4, are situated on the ground floor, and in the line before these are connected inductance coils which, with the heavy insulation of the trans-

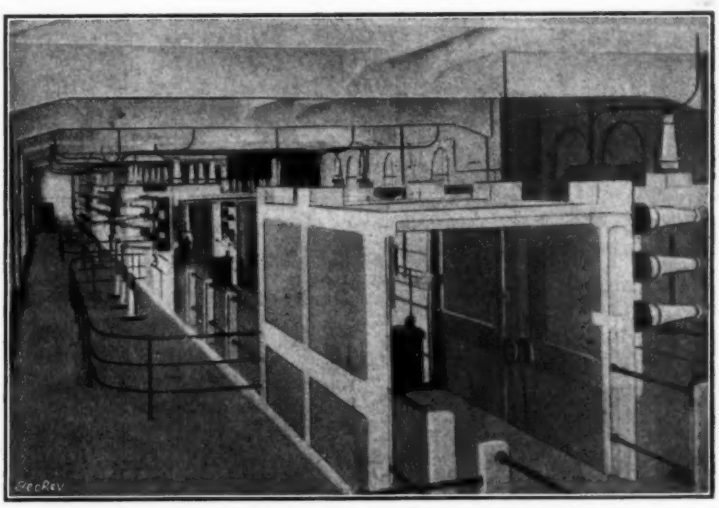


**Fig. 2.—View of 120-kV Switchgear.**

formers, are calculated to give adequate protection against surges.

The main transformers are located in special separate fire-proof rooms. Each group of transformers, consisting of three single-phase star/delta connected trans-

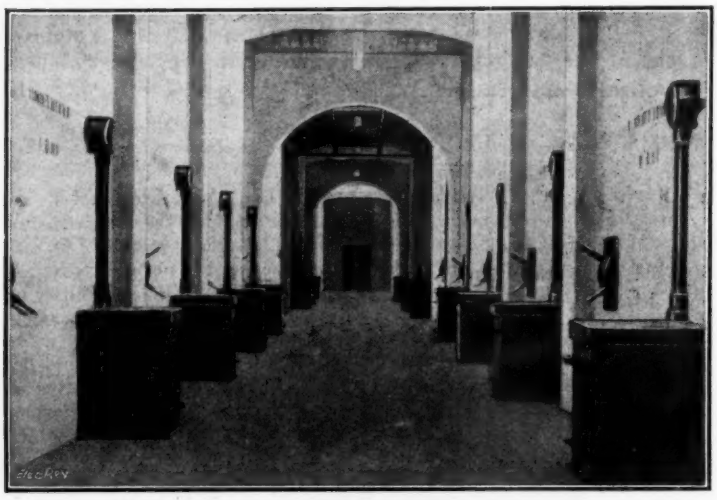


Fig. 3.—35-kV Operating Gangway.

formers, constitutes a single unit from the erection point of view. Each is isolated by fireproof partitions from the other units, so that if an explosion should take place in one unit no interruption would be caused on other parts of the system.

All the h.p. conductors of the 120-kV system consist of hard-drawn copper tubes 38 mm. in outside diameter and 2 mm. thick. On account of the long length of the 120-kV bus-bars the conductors have been furnished with expansion joints and all the free ends of the tubes

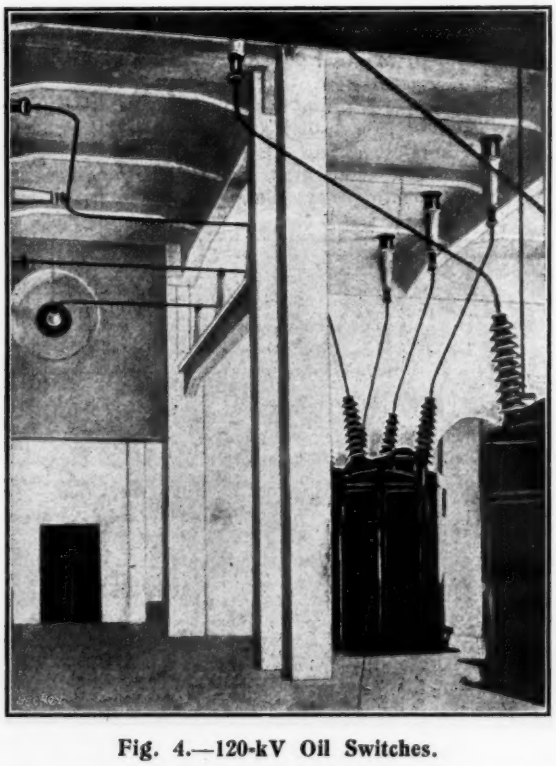


Fig. 4.—120-kV Oil Switches.

fitted with spheres to minimise corona losses. The arrangements adopted for the bus-bar system are such that it can be made dead in sections, so that it is possible to carry out thorough inspection of important parts when there is not very much load on the station.

There are three main control boards in the sub-station, one for the sub-station proper, one for the tertiary installation in the sub-station, and the switchboard for local distribution. The first two are placed in a control room located on the second floor, while the local board is on the ground floor. In relation to the building in general, these rooms are located between the 120-kV and 35-kV switchgear, and in the most central part. Fig. 3 is a view of the 35-kV operating gangway. Suitable reactance equipment, fig. 5, is arranged in the 35-kV circuits. A diagrammatic indication of the system not only shows the transformer connections, but also the transformation ratio by means of different colours.

The relay protection for the incoming lines has been so devised that completely selective release can be obtained under all conditions. For the two 120-kV lines the relays consist, in the first place, of three-phase differentially-connected overload time-limit relays in combination with three-phase interlocked reverse power relays; in addition, there are locking relays and earth-fault relays. If a short-circuit between phases occurs on either of the lines, the reverse power relay for the line in question operates instantaneously and releases the differentially connected overload time-limit relays belonging to the faulty line. The reverse current then rises to a predetermined maximum value, when the overload relays effect the release of the line oil switch in question. At the same time the tripping device of the

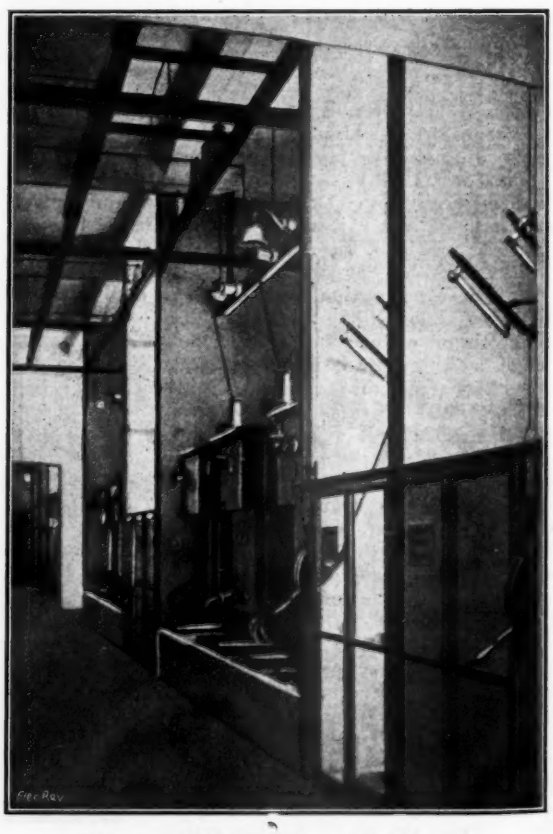


Fig. 5.—35-kV Reactance Equipment.

other line oil switch is locked for a sufficient length of time to allow of certain selective release of the circuits from the generating station to the point of the fault. Both lines are capable of carrying double their normal power continuously, and each transformer double the

normal output for eight minutes, so that the attendants, after receiving the signal of the fault, have sufficient time to switch in the spare transformer without in any way necessitating a reduction in the load handled by the station.

On the occurrence of an earth fault on any of the phases, a voltage relay is closed which releases the line circuit breaker. The transformers are protected by differentially-connected and overload time-limit relays. The differential relays serve only to protect that part of the transformer equipment which lies between the two transformer oil switches

We are indebted for the accompanying illustrations to the Swedish General Electric Co., of Vesteras, Sweden, which concern was responsible for a large portion of the plant.

# Electricity Supply in Worcester.

**An outline of a progressive municipal undertaking's activities, including details of an unusual type of powdered-coal-fired boiler and the methods utilised for supplying electricity in rural districts.**

(*Concluded from page* 819.)

*Other Boiler Modifications.*—Another idea that occurred to Mr. C. M. Shaw was to lower the front mud drum A as indicated in fig. 9, which would (i) eliminate the back wall of the combustion chamber, (ii) increase

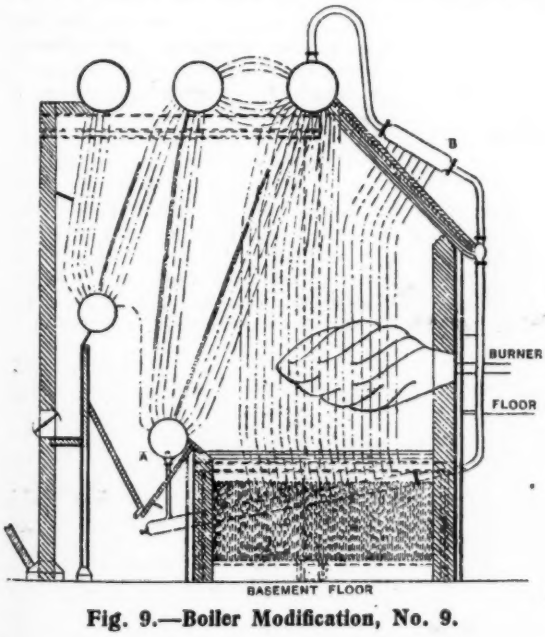



**Fig. 9.—Boiler Modification, No. 9.**

the heating surface area adjacent to the hottest part of the furnace, and (iii) diminish, or converge, the gas-passage area, thus approximating to a reduced gas volume. His experience of water-tube walls exceeding 26 ft. in length has given him confidence to arrange for the front banks of tubes of another boiler (at present erected in skeleton form) to be extended (minimum length between drums, 25 ft.) and for the flat brick arch of the combustion chamber to be replaced with two or three extra staggered rows of water tubes expanded into a header B that will be supported along the front of the boiler. This addition, with the water walls protecting the sides of the combustion chamber, is hoped to raise the capacity to 90,000 lb. evaporation per hour.

A third boiler (at present kept banked for emergency use) is to be somewhat similarly adapted, but the mechanical stoker is to be retained and supplemented by one p.f. burner as shown in fig. 10. It will be noted that a series of tubes expanded into each end of the top front steam drum will be led down into a circular header to form a water wall; the water will pass through a connecting pipe from the lower front drum to the header, the flow then dividing partly up the water-wall tubes and partly to a horizontal header in front of the boiler above the stoker hoppers, into which header 58 tubes (two rows) in staggered formation will be expanded and carried to the front drum to form a water-tube roof. This method of closing the top of the combustion chamber will make an expensive flat arch unnecessary and add in its stead substantial heating surface; the suggested modification is expected to add about 15,000 lb. per hour to the boiler's capacity (total about 50,000 lb.) and reduce brickwork maintenance.

*Electrical System.*—The transmission and distribution systems have been reorganised: three-phase 50-cycle energy generated at 6,600 volts is transmitted to decentralising centres where it is fed through Scott-connected transformers into the older 2,200-volt two-phase system, which method is convenient, obviates balancing trouble, suitable switchgear is cheap, and Berry radial transformers can be used on consumers' premises (200 volts). A 3-wire d.c. network (230 and 460 volts) is also in service, fed partly hydro-electrically and partly by motor convertors; the system is in course

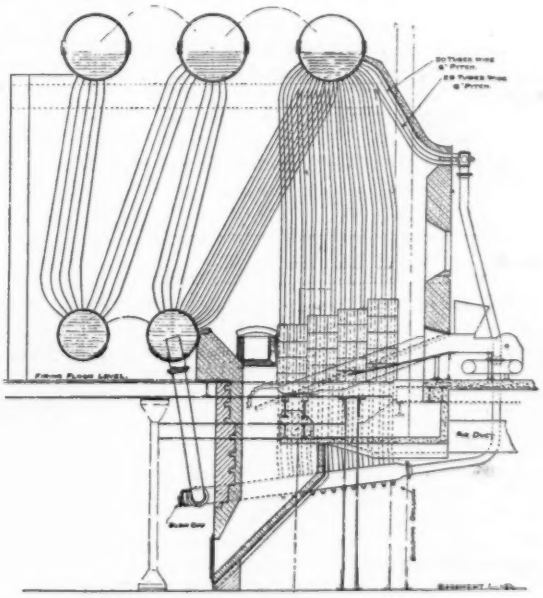


**Fig. 10.—Boiler Modification, No. 7.**

of being changed over to a.c. and will probably be completed during this year.

During the last few years distribution system extensions have been planned on broad lines and carried

out to meet the rapidly increasing demand. Some 67.75 miles of overhead mains and 128.5 miles of underground mains are in service, and 108 sub-stations, besides 56 transformers in private houses. During the year 1927-28 the energy sold increased by 2,424,999 kWh to a total of 11,647,783 kWh, the average being 2,721 kWh per consumer, or 228 kWh per head of population; the mean price obtained was 1.6d. and the mean profit 0.26d. per kWh sold. The consumers numbered 4,281, some 653 new ones having been added during the year, and 236 existing installations extended, whilst the following apparatus* was connected to the system: 523 radiators, 73 motors, 69 irons, 41 cookers, 25 kettles, 11 water heaters and boilers, 6 hotplates, 3 convertors, 2 grillers, 2 urns, and one toaster, which aggregated 2,347 h.p., the total connected equalling 16,898 h.p.

Fig. 11.—Spetchley Road E.H.P. Crossing.

Fig. 12.—Callow End Outdoor Sub-station.

Very satisfactory progress is being maintained in the sale of energy for domestic purposes; during 1927-28 it amounted to 1,345,191 kWh, besides 857,888 kWh sold for heating purposes. Quite recently the Town Council established a showroom, and appointed a lady demonstrator and two junior assistants; also it decided to inaugurate an assisted-wiring scheme for small houses and to undertake the sale of apparatus, both outright and on the hire-purchase system, all of which should tend to place the benefits of domestic electrification within the reach of would-be users who would otherwise be deprived of them by being unable to afford, unassisted, the initial cost of installation.

*Rural Electrification.*—In what is known as the "extended" district, including the bulk supply purchased by the Malvern District Council, 1,100,265 kWh was sold during 1927-28, double the amount sold in the previous year.

When the original rural scheme was being prepared, it was estimated that the constructional work would cost £33,000, and that at the end of two years' operation the energy sold would amount to 330,000 kWh per annum; the work had not been long in progress, however, before it became evident that greater provision would have to be made to meet a larger demand than had been anticipated. The main scheme has now been completed at a cost of £37,500 and, excluding the Malvern municipality's bulk supply, 842,354 kWh had been sold to private consumers after a complete year's operation.

The greater part of the constructional work was carried out by the Worcester Corporation Electricity Department's staff with direct labour in a very creditable manner, including the erection of the lattice steel towers of the e.h.p. lines, manufacturers' tendered prices having been judged too high; a number of the workmen have been retained, as the services of men thus trained are required for the maintenance of the overhead lines and for carrying out extensions which will become necessary to cope with the constantly increasing demand, in the stimulation of which a pertinent factor is the price charged for energy:—

Lighting: 5.5d. per kWh.

Power: 2.5d. and 1d. per kWh, plus 15 per cent. (Wright indicators).

Heating: 1d. per kWh.

Domestic: 20 per cent. of ratable value of house, plus 0.5d. per kWh.

These prices apply to the city area, those in the "extended area" being subject to 20 per cent. extra, all less 10 per cent. for prompt settlement of accounts.

The rural transmission lines are carried on lattice steel poles, painted dark green. Although operating at 6,600 volts at present, the copper conductors are carried by 11,000-volt insulators, and the cross arms have been suitably spaced for 33,000 volts in anticipation of future requirements, with double-insulator bridle terminals where necessary; for instance, fig. 11 shows the e.h.p. Spetchley Road crossing in 1927. So far as is possible all lines are rings, otherwise being fed from duplicate transformers, looped in and out of the sub-stations. The latter are either brick-built low structures housing Ferranti transformers (all interchangeable, 25, 50, 100 kVA, &c.) and simple George Ellison switchgear of the three-way and straight T-tapping varieties; or of the outdoor types illustrated in figs. 12 and 13, the pole-mounted transformer being associated with a

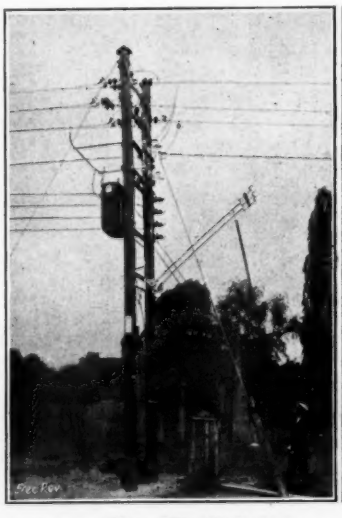


Fig. 13.—Pole-type Transformer and Switch-fuse.

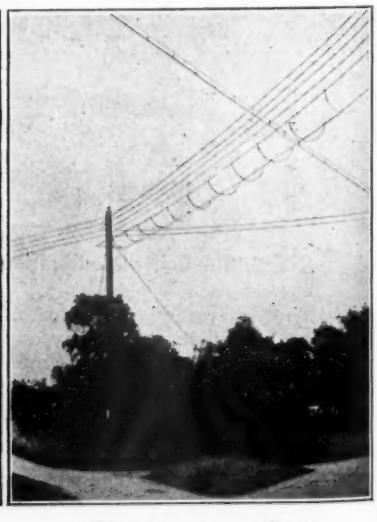


Fig. 14.—Low-voltage Line Guard.

* Based on definite notification to the Corporation Electricity Department by application form; there are no means of ascertaining consumers' unnotified additions.

Swedish switch-fuse; the method of operating it is indicated in the illustration.

The low-voltage distribution system is more extensive

**Fig. 15.—A " Hidden " Distribution Pillar.**

than is generally realised: carried on wood poles of the Post Office pattern, but shorter and slightly stronger, the smallest copper conductor is of 0.1 sq. in. sectional area, and some are of 0.2 sq. in. The load is growing rapidly, however, and the generous design has been amply justified; indeed, two additional conductors have had to be added to nearly all the single-circuit lines erected, as indicated in fig. 14, which shows a guarded l.p. line crossing a Post Office cable, and all poles have four insulator-pin holes drilled in them as a standard arrangement before erection. Service connection between the lines and consumers' premises is effected with insulated conductors, usually rear or side entry, as poles are never erected in village streets if doing so can be avoided, and attempts to shield the pole lines by locating them behind, rather than in front of, rows of houses have been strikingly successful; in fact, cases are on record of consumers actually paying the Corporation the cost of deviating a line so as to give it a side or back entry, and so preserve the front aspect of the premises. Thus unobtrusiveness is a feature striven for in every case, fig. 15 being an example of a " hidden " Henley distribution pillar in Victoria Street; not only is it less obstructive to pedestrians, but also economical, for one by no means large undertaking has spent over £100 per year on replacing such pillars which are dislodged or fractured by backing vehicles and similar street accidents.

From what has been written it will be apparent that the rural system has been liberally designed and carried out on very comprehensive lines in anticipation of a heavy demand for electricity for domestic and farming uses, which is materialising at a rapid rate.

# Our Overseas Electrical Markets.

### Economic conditions in Australia, New Zealand, South Africa and India.

BELOW are given, in accordance with our practice every quarter, a series of charts showing the trend of the import trade in electrical machinery and apparatus in Great Britain's principal overseas markets. At the same time general economic conditions in those markets are surveyed. It will be noticed that imports of electrical goods into South Africa, although still considerably below the level of those into Australia, are on the whole maintained at a steadier level than in the latter market. The feature of Indian business, which is much larger on the apparatus side than in machinery and plant, is the fact that Germany's share, while still small, is slowly but appreciably increasing

## Australia.

The labour situation in Australia shows little improvement and the movement to jettison the existing arbitration procedure seems to be gaining strength. At the same time there are a number of promising features in the economic position. Customs revenue has been increasing, the figure for April being nearly £500,000 more than in April, 1928. For the ten months of the financial year, receipts show results £1,600,000 below the estimates. In eastern Australia the weather during the first half of April was favourable to the crops. The total wheat yield of the Commonwealth is estimated at 168,000,000 bushels. Wool has been selling well. For the first half of the current financial year the value of merchandise imports totalled £72.603,000 as compared with £80,659,000 in the corresponding period of the previous year, while that of exports of merchandise totalled £66,906,000 as compared with £69,085,000. The fact that imports have declined to a greater extent than exports, thus reducing the unfavourable trade balance, is a reassuring sign. During the same period the value of electrical machinery and appliances imported totalled £2,968,000 as against £3,852,000 in the corresponding period of 1927-28. The keen nature of American competition in the machinery trade of Australia is shown by some statistics recently got out by the Senior Trade Commissioner at Sydney. Of a total value of machines and machinery imported in the December quarter of 1928 amounting to £3,976,100, no less than

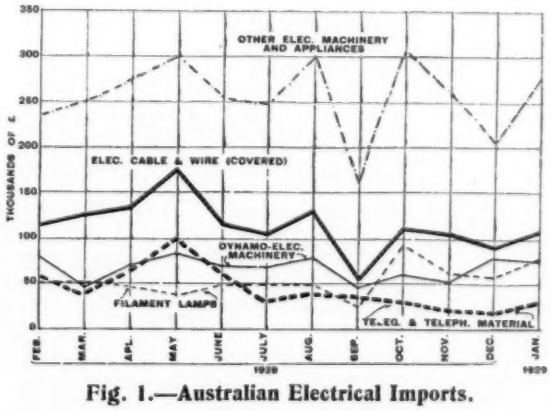



**Fig. 1.—Australian Electrical Imports.**

£1,576,700 represented United States products. This sum stands very near to that representing British imports of machinery during the same period, viz., £1,768,900.

For the purpose of counteracting the pessimistic views which have been spread abroad regarding the effects of labour troubles in the Commonwealth, the Government has been drawing attention to certain favourable features of the economic life of the country. Evidence of progress

is found in the returns of the State Savings Banks. Excluding Queensland, where the State institution has been absorbed by the Commonwealth Savings Bank, the excess of deposits over withdrawals from the banks last year was nearly £10,000,000. Adding similar figures relative to the Commonwealth institutions it is estimated that the total savings of Australians last year were approximately £14,000,000. Another Government communication points out that between 1917 and 1927 Australian products to the value of £125,000,000 had been exported annually, that the Commonwealth would eventually produce 600,000,000 bushels of wheat annually, a quantity sufficient for the requirements of 100,000,000 people, and that primary and manufacturing production together between 1901 and 1921 had advanced from £30 per head of the population to £73, while the total value of production had nearly quadrupled during the same period. It is claimed by the Government publicists that although strikes undoubtedly have a depressing influence, their occurrence is less noticeable in the Commonwealth because the progress and prosperity evident everywhere overshadow recurring industrial disturbances. The problem of seasonal unemployment is to be dealt with by the authorities in the separate States by the establishment of committees which will study means for bringing about a greater degree of stability in industrial activities.

### New Zealand.

In New Zealand the banking situation shows a very marked improvement compared with, say, six months ago. Then the banks were endeavouring to attract fixed deposits. Now they are not finding it altogether easy to invest the funds in their hands. There are few signs of the bad impressions left by the excessive granting of credit which took place a year or two ago. Expenditure on luxuries has been undoubtedly brought down to reasonable dimensions. In agriculture a favourable symptom is the attention which is being given to the use of machinery and modern implements as well as of fertilisers, instead of the indiscriminate bringing into cultivation of land of doubtful value. From both the sheep and grain farms good reports are forthcoming For dairy produce a record export season is assured. With regard to wool, although prices have fallen, the clip is

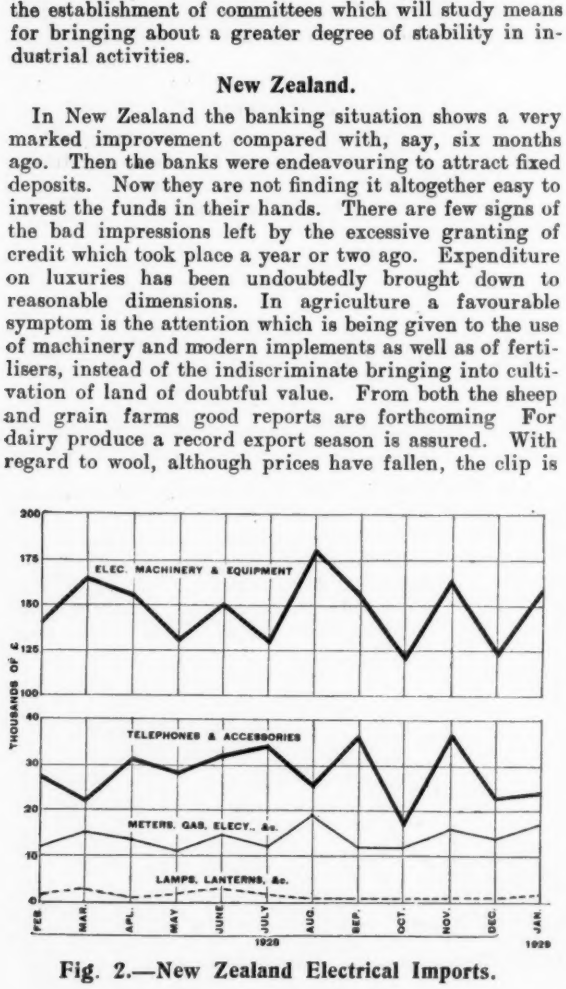



**Fig. 2.—New Zealand Electrical Imports.**

substantially larger as the number of sheep shows an increase of more than a million, and the results to the producer are expected to be profitable. The demand for beef from the United States continues to expand and the prices of mutton and lamb are very satisfactory. Against these favourable factors, however, it is expected that the wheat yield will be smaller by a million bushels and the barley and oat crops also less than last season. During the twelve months ended March 31st last there was a favourable trade balance of £12,000,000. Judging by the progress of export trade so far this season, the result will be more satisfactory than during the record season of 1924-25. Meanwhile, imports also have been increasing in value and consequently it is hardly to be expected that the balance of trade will be as favourable as it was at the end of June last. In the opinion of the *Auckland Weekly News* the meaning of the foreign trade returns is that the volume of New Zealand's production and the prices prevailing for her chief commodities form the basis for a fuller and more general enjoyment of prosperity than has ever previously been experienced. The Government has shown its confidence in the economic situation by announcing its support of a bold policy of railway development and public works. This should stimulate trade in every branch.

### South Africa.

In South Africa one excellent barometer of trade and industrial activity, namely, railway earnings, stands high. Their total during the twelve months ended March

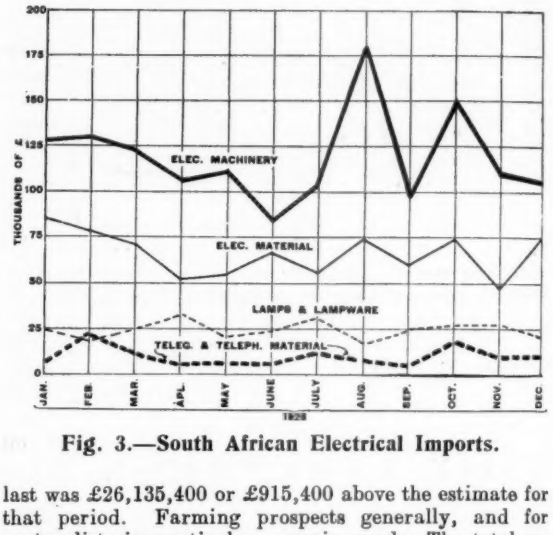



**Fig. 3.—South African Electrical Imports.**

last was £26,135,400 or £915,400 above the estimate for that period. Farming prospects generally, and for pastoralists in particular, remain good. The total exports of maize and maize products for the season were 7,275,000 bags. February's estimate of the yield of the new crop was 20,548,000 bags, but since then the figure has been lowered. The new sugar crop is expected to be about 315,000 tons, compared with 295,000 tons a year ago. The important position now held in the economic life of the Union by the fruit industry is indicated by certain statistics which have recently been made public. The total citrous exports during the 1929 season are roughly estimated at 1,100,000 standard cases. Exports of deciduous fruit for the season up to March 31st, were 1,332,000 boxes—a decrease of 400,000 boxes on the previous twelve months, owing to a disappointing crop of pears.

Manufacturing activities are for the most part well maintained. The satisfactory state of the building trades indicates a continuance of the demand for many kinds of electrical apparatus and fittings. The trade in motor vehicles has been brisk—which is another sign of prosperity—but that in agricultural plant has been rather below expectations. Business in the latter will probably revive now that weather conditions have begun to help the farmer.

It would be unfortunate if the dispute between the Electricity Supply Commission and the Railway Administration over the charges for energy from the Salt River and Colenso power stations were to check the progress of railway electrification in the Union. The railway manager states that whereas formerly only 0.8d. per kWh was paid for power, the " impossible " price of 1.3d. per kWh is now being charged, and that the annual working expenses of the line were £488,000 against an estimate of £170,000 by the consulting engineers. The matter has been investigated by a committee, which has referred it to the Electricity Control Board. On behalf of the supply undertaking it is pointed out that the railway's figures take no account of the earnings on coal,

which was formerly carried free for locomotive purposes, and further that an anticipated increase of 25 per cent. in traffic has not materialised, there having actually been a decrease of 25 per cent.

### India.

An examination of the foreign trade returns of India shows that in spite of labour troubles monthly imports of machinery and millwork have kept at a very steady level of value, *viz.*, an average of Rs. 150 lakhs or about £1,125,000. From the explanatory memorandum of the Indian railway budget for 1929-30 it appears that in the Bombay area the electrification of suburban lines is practically complete. The proposed extension of the electrically-operated suburban service from Boroli to Virar has been deferred for the present. On the Great Indian Peninsula Railway the suburban scheme which comprises the electrification of the Harbour Branch, of all tracks from Bombay to Kurla and the local lines from Kurla to Kalyan, is virtually complete, and all goods traffic between Bombay and Kalyan is now electrically operated. It is expected that the main line to Poona will be ready for electric traction during the current year and up to Igatpuri by 1930. The work on the Kalyan power house is well in hand and it is expected to be finished during 1929-30. On the South Indian Railway financial provision has been made for the electrification of the Madras suburban area. Altogether Rs. 170 lakhs (£1,275,000) will be expended and the work will take three years to complete. The scheme for the electrification of the Calcutta suburban railways is still under consideration.

By the end of August next it is hoped that the Glen Morgan power scheme on the Pykara River will be completed and power available. The transmission line thence to Coimbatore, about 70 miles distant, will be one of the longest in India. Transformers, switchgear and line materials have been ordered by the Ootacamund and Coonoor Municipalities from the British Thomson-Houston Co., who are also the suppliers of the plant and machinery for the main station.

This continuance of electrification work is a fair assurance that British electrical firms will benefit by the expenditure of £20,000,000 which the Railway Department is undertaking on productive works. Lord Peel, Secretary of State for India, in pointing out recently that Indian purchases in Great Britain stood at 5s. 3d. a head, while those made by New Zealand were £13 5s.,

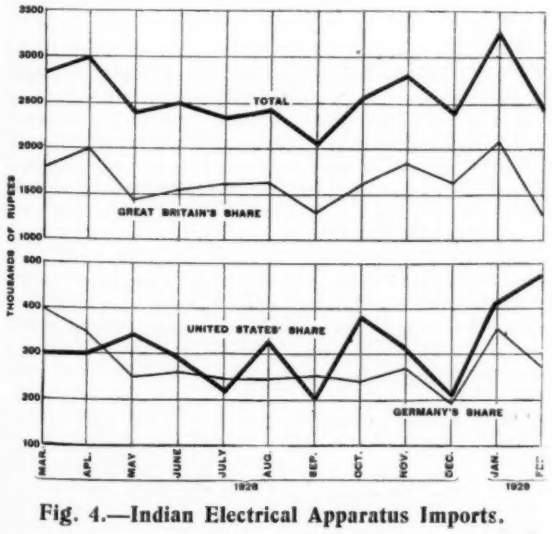



**Fig. 4.—Indian Electrical Apparatus Imports.**

alluded to the good reception given in India to the report of the Commission of Agriculture, which should result in raising the standard of living in the country and thus increasing its purchasing power. He recommended British commercial interests to keep in touch with the work of the Indian Tariff Board and, in the event of higher import duties being under consideration, to lay their case before that body.

In granting the application of the Indian Cable Co. for the removal of the import duty on electrolytic copper rod and the levy of one of 5 per cent. on certain rubber insulated electric wires and cables, the Tariff Board made it clear that it was considered policy to remedy

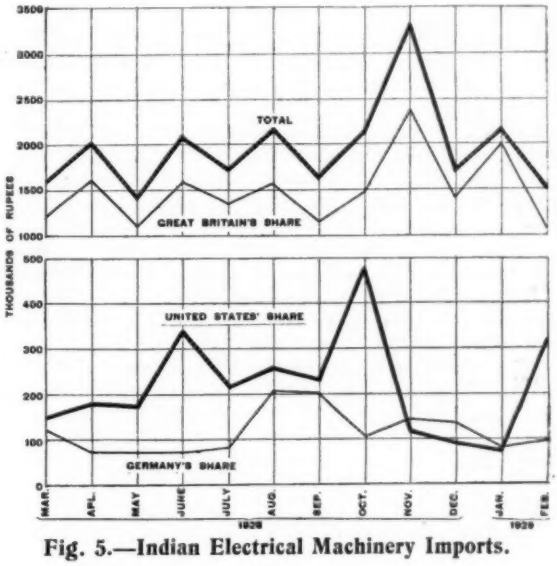



**Fig. 5.—Indian Electrical Machinery Imports.**

any inequality in tariff treatment between any Indian manufacturing concern and its foreign competitors, particularly when its supplies of imported raw materials were affected.

### South African Trade Affairs.

Some time ago the British National Union and the South African National Union planned a business tour of the Union of South Africa, expecting that 50 representative British business men would take part. The proposal was warmly welcomed both in this country and in South Africa, but in spite of this only twelve men expressed a desire to participate in the tour. In view of this poor response, the organisers were compelled to abandon the project. The need for every effort to promote British trade in the Union is apparent when it is remembered that the British share of the total import trade fell continuously from 56.4 per cent. in 1922 to 44.8 per cent. in 1927. In his last report on South African conditions (Elec. Rev., November 2nd, 1928, p. 771), Mr. N. Elmslie, Senior Trade Commissioner in South Africa, attributed this gradual decline to the higher prices of British goods, but he also detailed a number of contributory causes which have had their origin in the Union itself. The Union Government has reduced considerably the proportion of its requirements which it obtains from this country, and its Customs policy has not been such as to give an impetus to British trade. By the Customs Act of 1925 the general preferential rebate of duty on imports of United Kingdom origin was withdrawn. It is only fair to put against this, however, Mr. Elmslie's opinion that there is considerable room for improvement in the manner in which British manufacturers regard the market. More efficient service is said to be necessary, while skilful propaganda emphasing the superior quality of British goods would go a long way towards discounting the adverse effect of higher prices.

It is probable that the recently discussed commercial treaty between South Africa and Germany has created a feeling of uncertainty in this country. This treaty would extend to German goods equal treatment with those of Empire countries in the event of the institution of preferential rates in the future, besides giving them the existing preferences upon their extension to other Empire countries.

# Overhead-line Protection.

**For guarding against atmospheric surges the author advocates increasing the factor of safety o machines &c., rather than the provision of lightning arrestors.**

By L. F. RATCLIFFE.

SURGES due to atmospheric and other effects have been known to cause the breakdown of electrical apparatus connected directly to overhead-line systems, and it is generally agreed that some form ot protection should be provided against them. Opinion is by no means unanimous as to the form this protection should take, although in a broad sense only two alternatives present themselves. The factor of safety of all apparatus directly connected to the system may be increased to cover surges, or the same result may be aimed at by employing so-called lightning, or surge, arrestors.

The contemplated development of rural districts where the load is scattered over a considerable area is only commercially possible by the adoption of an overhead line system of distribution of the very simplest type.

The capital costs of distribution to make the scheme possible will admit of none but the very bare essentials being provided, so that the decision as to what measures should be taken to protect these lines and the apparatus connected to them against atmospheric effects therefore becomes of great importance. The problem is one of economics and can only be solved by a very careful analysis of the capital damage resulting from atmospheric disturbance to existing stations.

Happily the need for this data has come at a time when great advances have been made in our knowledge of atmospheric phenomena and the surges they produce. Largely due to the inventive genius of Du Four, it is now possible to substantiate the theories based upon past experience by actual test results taken in storm areas, so that the subject takes for the first time the nature of a concrete and exact science. It is now possible to design a distribution system and protect it so that it is definitely immune from atmospheric effects of a dangerous magnitude, a claim which certainly could not be justified a few years ago.

A resumé of the work done in the past, and a consideration of the origin, nature, magnitude and frequency of the voltage surges produced by atmospheric effects is necessary before the subject can be got in proper focus and preventive measures decided upon, if necessary.

*Origin of Surges.*—Electrical systems possess the characteristics of inertia, with the result that a change in the magnetic or electric field from one condition to another requires a definite period of transition while the system acquires or dissipates the energy of momentum. Whenever the amount of energy injected into or withdrawn from a system changes, therefore, a surge is produced, the magnitude of which bears a relation to the change in conditions and characteristics of the circuit. In practice, under normal conditions, the load upon a supply network is continually fluctuating throughout the day, and the system is continually subject to surges. These surges are of a transient character, and continue to flow until they are finally absorbed by the impedance effects of the network. In general, however, surges created in this way are of insufficient magnitude to cause trouble, and can be safely ignored. The sudden injection into, or release of energy from, a system occasioned by atmospheric or fault conditions gives rise to surges of a very serious nature indeed.

These notes deal with surges created by atmospheric effects only, although those resulting from faults are very similar. Such conditions are characterised by a heaping up of potential at a point in the system which travels along in the form of a pressure surge of steep wave front. The pressure between conductors and any of the conductors and earth is as a result greatly increased, and the potential gradient along the line due to the steep wave front rises from a few volts to possibly several thousand volts per yard run. The increase in potential tends to spill over and stress the supporting insulators or dielectric above normal, and the high voltage gradient along the line tends to overstress the intervening dielectric at points of the conductor in close proximity to one another, such as in transformer and machine windings.

*Production of a Surge by Atmospheric Effects.*—The production of surges by atmospheric effects can be generally explained as follows: If a cloud becomes electrically charged, there is a difference of potential between the cloud and the earth immediately beneath it. Intermediate objects which lie in the static field between the earth and the cloud receive a charge, according to their nearness to the earth and the cloud. An overhead line passing through the static field produced by an electrically-charged cloud will itself become charged in that local area. No strain will exist between the overhead line and the cloud or earth, however, all the time the charge is bound to the cloud. Directly the cloud discharges to earth the static field disappears, leaving a portion of the overhead line in that locality very highly charged. The conductor on both sides of the affected area, being uncharged, is at a lower potential, with the result that a current flows and a surge is set up travelling outwards in both directions from the disturbing centre.

*The Nature of Surges.*—A knowledge of the nature of the surge, its speed of travel, wave shape and magnitude is obviously necessary before preventive means can be devised. Overhead-line systems possess resistance, inductance and capacity, and therefore form a damped oscillatory circuit, the velocity of surges or travelling waves being given by $v = 1/\sqrt{LC}$ (1), where $v$ = velocity wave in miles/sec., $L$ = inductance in henries/mile, and $C$ = capacity in farads/mile.

By the substitution of average values of inductance and capacity of various pieces of apparatus in the formula given in equation (1), the velocity of travel of waves through various circuits has been calculated and is given in the following table:

Velocity of Travel of Surges.

| Circuit. | Velocity in Miles per Second. |
|---|---|
| Overhead lines ... ... | 186,000 |
| Cables .. ... ... | 80,000 |
| Generators ... ... ... | 40,000 |
| Transformers ... ... | 40,000 |

It can be seen that for overhead lines the velocity of travel approaches that of light, whereas for machines and transformers where the inductances and capacities are much higher the velocity is considerably reduced. The magnitude of the voltage that can be induced upon a given overhead line is limited by the value required to spill over the supporting insulators. By this is meant the impulse spill over-value, not the sustained

value, which is very much less than the impulse spill over-value, in fact, as a general rule, it will be found that the ratio of impulse spill over-voltage/sustained spill over-voltage = 2 (2).

The current that this voltage produces flows through inductances of the line and into the capacity to earth, and is limited by the distributed inductance and capacity per unit length of circuit. From a number of calculations it has been ascertained that the combined inductance and capacity of overhead-line systems known as the surge impedance falls between the limits of 300-600 ohms. Assuming a value of 400 ohms for surge impedance, a reasonable figure to take, a surge current of 2½ A will flow for every 1,000 V of surge pressure.

Summarising the results obtained immediately above it can be seen that :—

(1) The velocity of the travelling waves or surges will be of the order of 40,000 to 180,000 miles per second.

(2) The maximum voltage surge possible upon an overhead-line system is limited by the impulse flash or spill over-value of the supporting insulators.

(3) The current created by this voltage surge depends upon the surge impedance of the system, which is generally of the order of 400 ohms.

(4) If this figure is adopted the maximum surge current possible is limited to 2½ A for every 1,000 V of surge pressure.

So far the magnitude of the voltage and current surge to be dealt with has been arrived at by theoretical means,

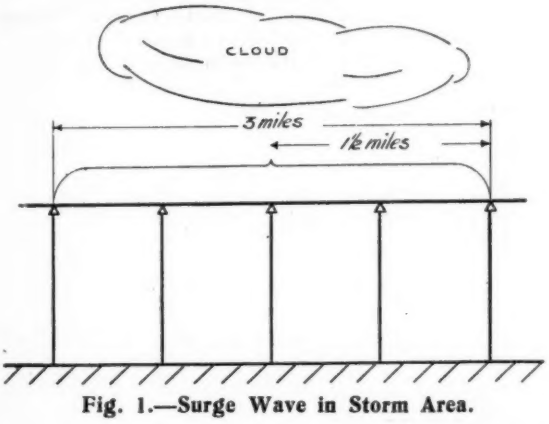



**Fig. 1.—Surge Wave in Storm Area.**

and its velocity of travel determined. The enormous velocity of the travelling waves will immediately suggest that whatever preventive device is used will have to operate very rapidly, and directs attention to the actual period of time within which the device must function. Theoretically, an idea of the time available can be obtained by considering the area usually affected by storms. Observations indicate that storm areas very rarely exceed 2—3 miles in extent and if it be assumed that the surge wave has its peak in the middle of the affected area, as shown in fig. 1, it must fall from maximum to zero over a distance of about 1½ miles, and as its velocity is of the order of at least 50,000 miles a second it will reach its maximum and pass any given point in an overhead line in about 1.5 micro seconds. From theoretical considerations, therefore, it would appear that any preventive device employed would have to be capable of absorbing or shunting sufficient of the surge current to earth in about 1.5 micro-seconds, so as to leave the remainder a harmless quantity.

It is important to note the behaviour of these travelling waves as they pass through circuits of different characteristics. Whenever the surge impedance increases, it tends to obstruct the passage of the travelling wave, causing it to build up and be reflected back on to parts of the circuit of lower impedance.

Where the surge impedance suddenly becomes very high, such as at the open end of a line, the pressure wave is doubled by this process and reflected back on to the system. If, on the other hand, the surge impedance suddenly becomes zero, as in the case of a short-circuit to earth on the system, the initial surge pressure is reduced to zero at this point, but is replaced by a negative wave of equal magnitude which is reflected back on to the system. The ideal case for a preventive device is, therefore, to possess a low impedance to reduce the pressure wave at that point to a small value and large energy absorbing properties, so that very little energy remains to be reflected back on to the system. Before considering the practical application of the theoretical considerations made above, it is of great interest to review the results of actual observations made in storm areas.

*Actual Investigations into the nature of Surges.*—It has been possible by means of the cathode-ray oscillograph invented by Du Four to actually record transients which occur upon overhead-line systems as a result of atmospheric disturbances. Although much work remains to be done in this direction, it is interesting to compare the results of actual observations that have been made with the theoretical considerations enunciated above. The practical results obtained may be summarised as follows :—

(1) The travelling waves observed took at least 3 micro-seconds to reach their peak value and pass a given point in the overhead-line system, except in cases of insulator flash-overs, in which the time was much shorter.

(2) High-voltage surges of steep wave front are very quickly damped as they travel along the line, partly by corona losses.

(3) Medium-voltage surges, particularly those below the corona limit, may travel a considerable distance without material change in characteristic, and are the most frequent and dangerous to contend with.

(4) From the overhead lines under observation, it was found that disturbances of sufficient magnitude to be dangerous to the insulation of apparatus were comparatively rare.

*The Protection of Overhead-line Systems.*—From the investigations made it is now possible to decide in a broad sense upon the measures to be taken to protect overhead-line systems. The magnitude of the charge induced upon the line by atmospheric effects depends upon its position in the static field. The height of overhead lines above the ground does not vary greatly, therefore they can be said to have a definite and constant position in the static field, whatever the system voltage may be. The higher the system voltage, the lower the ratio of maximum induced voltage to line voltage becomes, making the effect of atmospheric disturbances much more serious upon low-voltage lines than upon very-high-voltage lines; *e.g.*, a surge pressure of 200 kV would have very little effect upon a 200-kV system, but would be extremely damaging upon a 33-kV system.

Upon overhead-line systems above 66-kV operating in this country, it is found that the factor of safety of the line insulators, together with the damping effect of the long lines, is sufficient to withstand any likely atmospheric effect without damage. The usual earth wire should, of course, be included, and a double earth wire is an advantage for 66-kV lines. It is for systems operating at pressures below 66-kV that special consideration has to be given to the question of atmospheric disturbances. In this country there are several overhead lines operating at pressures below 66-kV upon which no special precaution is taken to guard against atmospheric effects, and it has not been found necessary to provide any protective devices or increase the factor of safety of the apparatus used at all. On the other hand, there are instances in this country and upon the Continent where dangerous surges have been of frequent occurrence, demanding the use of special protective devices and increased factors of safety. Such effects have, however, been mainly of internal origin, or else

they have appeared upon lines passing through areas which are subject to heavy storms.

The lightning arrestors available for use upon such systems can be usefully divided into two classes:—

(1) Those that protect against excess pressures between lines and to ground only.

(2) Those that protect against excess pressure and also smooth out the wave shape of surges of comparatively small pressure.

Those in the first class invariably comprise a horn gap with some form of impedance in series to limit the flow of dynamic current when they operate, and can be obtained at very little cost. The second type consists of either a condenser or inductive device permanently connected in circuit, and is very expensive to instal when compared with the cost of a simple overhead-line circuit. The information actually obtained in storm areas confirms the opinion of several authorities and clearly indicates that it is the pressure waves of comparatively small magnitude, but of steep wave front and high frequency, that are most common and destructive, and the second class of arrestor is the only one which can deal with such surges at all sufficiently.

The commercial cost of lightning arrestors of the type capable of smoothing out the shape of a high-frequency surge with a magnitude no more than normal voltage, definitely prevents them being used on small lines where economy is essential. The result of experience and information obtained in the past indicates the following:—

(*a*) Protection against excess pressure between conductors and between any conductor and earth is best obtained by the use of arrestors.

(*b*) Protection against surges of comparatively small magnitude, but steep wave front, is best obtained by increasing the factor of safety of the apparatus installed on the system.

(1) Where overhead lines pass through a district which is not subject to heavy storms, and where the line itself is not in a position to receive directly the operating shocks of the whole system, no precaution against surges is necessary.

(2) When, however, the line is short and liable to receive the switching shocks directly of the whole system, giving rise to excess pressures of a dangerous magnitude, especially at the " dead " end, arrestors should be used.

(3) For lines passing through bad storm areas and of reasonable length that are likely to be subject to surges of steep wave front, but of inconsiderable magnitude, the factor of safety of the apparatus installed should be increased and no arrestors need be used.

The accumulation of experience upon the Continent and in this country has enabled a simple rule to be formed, so that machines and transformers for direct connection to overhead-line systems coming within the scope of grade (3) may be provided with a suitable factor of safety; this is obtained by designing them to meet a test pressure of

$$2E + 10 \text{ kV} \quad \ldots\ldots\ldots\

tion of land required for sub-station sites and other purposes, and to deal with all questions in relation to the obtaining of wayleaves not coming within certain guiding principles which the Board laid down; the committees meet at short notice to deal with cases as they arise.

The procedure laid down by the Act for the preparation of schemes and the methods adopted by the Board in considering and adopting schemes are outlined. Up to December 31st, 1928, the Board had considered five schemes, and adopted four; the salient facts relating to them are outlined in Table I.

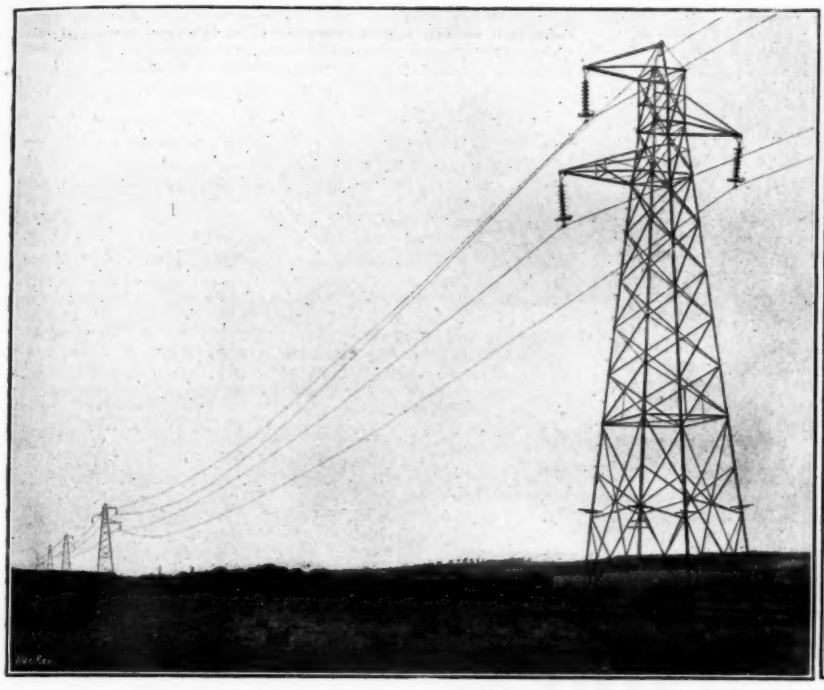


**Fig. 2.—First Line in Scotland to be Commissioned at 132-kV, erected by B.I. Cables, Ltd.**

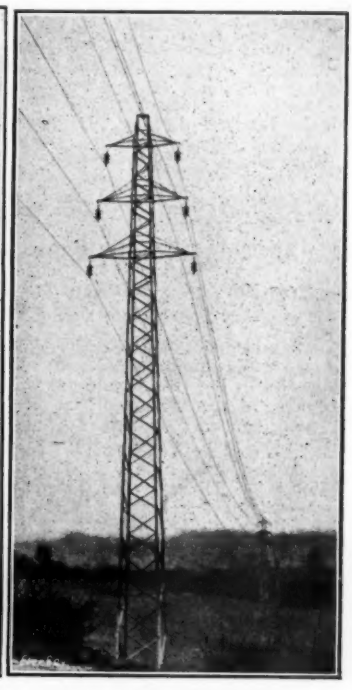


**Fig. 3.—Secondary Transmission Line.**

The organisation at headquarters consists of the engineering department, the accountant's department, and the secretariat, including the solicitor's branch. The engineering department is sub-divided into the construction, the operating, the research, and the supply sections. Each district engineer has also attached to his staff a wayleave staff whose duty it is to obtain all the wayleaves necessary for the erection of the "grid" in his area. All wayleave questions not coming within the principles laid down by the Board are referred from each district to headquarters for decision by the Wayleave Committee, so that wayleaves may be negotiated on the same principles in all the areas. The staff of the Board at December 31st, 1928, consisted of 59 members in London, and a total of 48 in the four district offices.

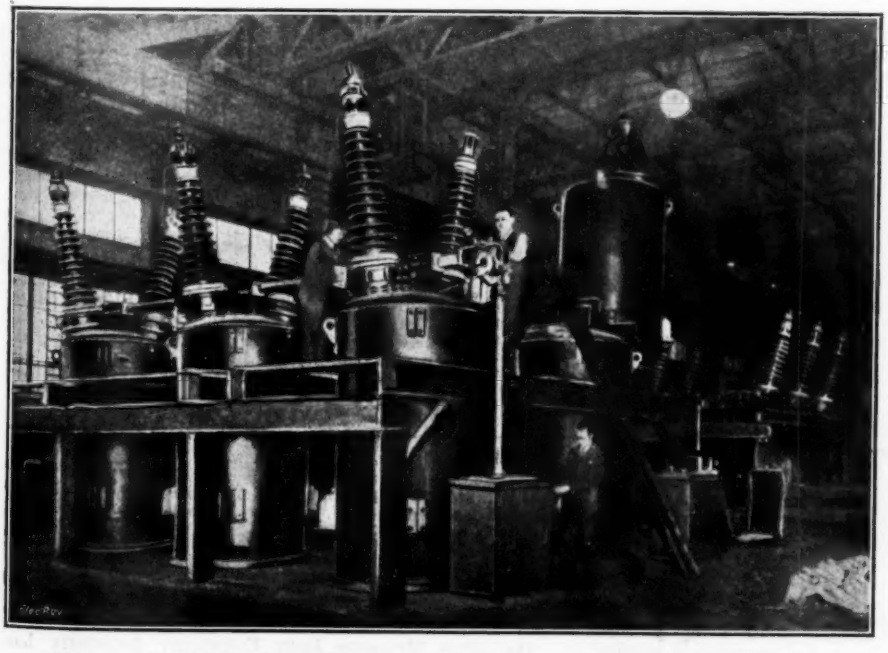


**Fig. 4.—"Grid" Circuit Breakers During Assembly in Maker's Works.**

Representations were received from the greater number of the undertakers concerned in each area, relative mainly to detail and development at particular stations, rather than to criticism of the general provisions. As a result of them and of conferences and inquiries the schemes as submitted by the Electricity Commissioners were adopted with little modification. In the case of the Central England scheme, both the Birmingham Corporation and the Shropshire, Worcestershire and Staffordshire Electric Power Company questioned whether the anticipated savings under the scheme were sufficient to justify the higher expenditure which they estimated would be necessary to provide for frequency standardisation, although they expressed themselves as ready to co-operate fully with the Board. The estimates adopted by the Electricity Commissioners on the assumption that work would commence in 1928 were that a net expenditure of £2,061,400 would be necessary. The revised estimates on the basis of work commencing in January, 1930, were £4,336,700 gross, which sum includes certain expenditure to be incurred by the undertakers at the time of frequency change, which would in any case have been required by them, but at a somewhat later date; a proportion of this ante-dated expenditure will be recoverable from the undertakers later. After reviewing all the circumstances the Board concluded that, in spite of the heavy increase in the anticipated expenditure on standardisation, it was necessary that this work should not be delayed.

In the case of the North-West England and North Wales scheme, criticism was directed against the rate at which the Commissioners had assumed that the consumption of electricity

in the area would develop, and there was also some natural anxiety on the part of the important undertakers in South-

TABLE I.—SCHEMES ADOPTED.

| Scheme. | Area, Sq. Miles. | Population (1921 Census). | Sale of Electricity 1925-26 Millions of kWh. |
|---|---|---|---|
| Central Scotland ... ... | 4,980 | 3,761,200 | 528 |
| South-East England ... | 8,828 | 11,392,561 | 1,283 |
| Central England ... ... | 7,311 | 5,218,146 | 715 |
| North-West England and North Wales ... ... | 9,082 | 6,980,925 | 1,214 |
| Total adopted ... | 30,201 | 27,352,832 | 3,794 |
| †Mid-East England ... | 7,455 | 4,529,880 | 703 |
| Total ... ... ... | 37,656 | 31,882,712 | 4,497 |
| Great Britain ... ... | 88,141 | 42,769,196 | 5,606 |

† Adopted on March 19th, 1929.

East Lancashire that their undertakings, which are so largely devoted to supplying the requirements of the textile and other industries in the area, should not be unduly burdened by the inclusion in the scheme of less densely populated areas of Westmorland and Cumberland. The Board did not feel justified in adopting anything less than the whole of the area contemplated. Future expansion assumes particular importance in this area in view of the fact that the cotton industry and its subsidiaries are largely concentrated within the area of this scheme and are at present in a very depressed condition. After full consideration, the Board came to the conclusion that, with a return to more normal trade conditions, the estimated output might reasonably be reached, although the effect of continued adverse trade conditions might be to postpone the realisation of the estimates to a later date.

The details of the schemes are set out in the report and maps show the area covered by each, the selected stations, the sub-stations, and (diagrammatically) the route of the "grid" lines. There is also included a technical description of the "grid," with diagrams of the towers and layout of the sub-stations, as well as five photographs showing towers actually erected, a tower undergoing a test, and a grid circuit breaker, some of which are reproduced herewith.

The "grid" will consist of some 3,000 miles of 3-phase overhead lines operating at the standard frequency of 50 cycles per second and a pressure of 132,000 volts. This system differs from the systems of the Continent and the U.S.A., which have mainly been developed to *transmit* large blocks of power over long distances from localised water-power or brown-coal areas. In Great Britain, however, the availability of suitable coal over wide areas and without wide variation of price, coupled with the fact that the country has no large water-power resources, calls rather for a system of *interconnection*.

*(To be concluded.)*

# Business and Industrial Notes.

**The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments. Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.**

## The Marking of Imported Glassware.

Further evidence was heard last week by the Standing Committee under the Merchandise Marks Act, 1926, which is considering an application for an Order-in-Council requiring that certain classes of imported glassware should bear an indication of origin. Mr. E. A. Hailwood (managing director of Hailwood & Ackroyd, Ltd.), spoke in support of the application, stating that buyers were often led into purchasing foreign glass in the belief that it was British. He said that between 75 and 80 per cent. of the illuminating glassware used in this country was imported; his company produced 20 per cent. or more of the British output. Witness considered that the glass could be marked without injuring it in any way and as for the suggestion that it would give the Customs authorities extra work, there were many men who were seeking employment. Another witness said that he had been employed for six years by one of the large manufacturers of electrical apparatus and fittings. Most of the glassware in those fittings was obtained from America and Sweden and the fittings were sold in packages which indicated that the entire contents were British. Similar evidence was given by other witnesses and the inquiry was adjourned until May 13th.

Upon the resumption of the hearing Mr. C. M. MILLS, secretary of the Chloride Electrical Storage Co., Ltd., gave evidence in opposition to the marking of glass containers for accumulators. He said that his company produced about 5,000,000 cells of different sizes per annum. Of these about 66 per cent. were made up in glass boxes or jars; of these, again, about 98 per cent. were in pressed glass boxes. As blown glass was used for the larger types, the actual value of pressed glass was only about 60 per cent. of the total. The company only purchased pressed glass from abroad. The glass represented about 10 per cent. of the cost of a cell. His company knew exactly where its glass came from, and therefore marking was unnecessary so far as it was concerned. The glass was purchased abroad, first because of the difficulty of obtaining suitable material in England, and, secondly, to keep open another channel of supply. At the same time, between 90 or 95 per cent. of the requirements were satisfied by home producers, for the latter had overcome a number of difficulties. It was felt, however, that the stimulus of some rivalry was essential if the British battery industry was to compete with foreign makers. The company was afraid that if the glass container bore an indication of foreign origin the ultimate customer would imagine that the whole of the battery or accumulator had been made abroad. It would be difficult to persuade him that only the container, representing 10 per cent. of the value, was foreign. He maintained that a marking Order would be very detrimental to an important British trade.

In cross-examination, Mr. Mills said that although there was not a great deal of difference between the appearance of British and foreign glass, the trade could distinguish one from the other. Asked if his objection to marking would be met if the words "glass foreign" were used, the witness said that it would be fairer to say that the glass was foreign because there was difficulty in obtaining it from British manufacturers. Later he said that the British battery manufacturers had done their best to encourage British glass makers, and he admitted that the latter had gone a long way to meet requirements. He concluded by saying that if marking were enforced the battery makers might have to consider the elimination of glass in favour of some compound for containers.

## Recent Contracts.

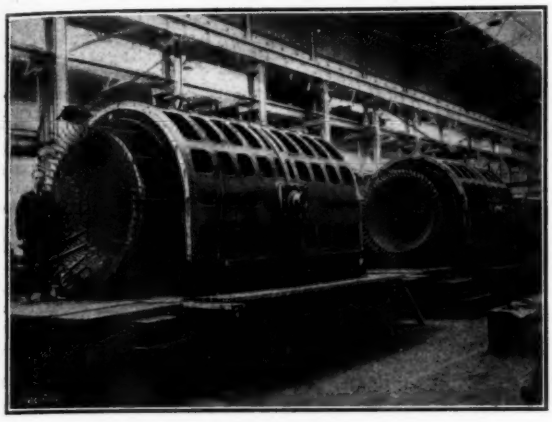
Mechanical chain grate stoker equipments for water tube boilers have recently been ordered from Messrs. EDWARD BENNIS & CO., LTD., for the Harrogate Corporation electricity works (per Yarrow & Co., Ltd.) and the India Rubber, Gutta Percha and Telegraph Works Co., Ltd. (per Yarrow & Co.). The latter order covers four forced-draught stokers with coal-handling plant. Mechanical coal- and ash-handling plants are being supplied by the company for the Grimsby Corporation electricity works (per Clarke, Chapman & Co., Ltd.), and the Douglas Corporation electricity works (per Richardsons, Westgarth & Co., Ltd.).

For the signalling of the new terminal station at Auckland, N.Z., the Westinghouse electro-pneumatic system of power operation, together with a.c. track circuits and day colour light signals, has been selected, and the contract has been awarded to the WESTINGHOUSE BRAKE & SAXBY SIGNAL CO., LTD. The plant (including the air compressors) will be supplied from England with the exception of the interlocking frame of 128 levers, which will be built in Melbourne, in the shops of an associated company, McKenzie & Holland (Australia) Pty., Ltd.

The WEST MIDLANDS JOINT ELECTRICITY AUTHORITY has awarded to the MITCHELL CONVEYOR & TRANSPORT CO., LTD., the contract for the building and civil engineering work (excluding steelwork) in connection with the "super power" station to be built at Bedwas, near Ironbridge, Salop. This will be the first section, designed to house two 50,000-kW sets; the ultimate capacity of the station will be 200,000 kW. It is expected that the contractors will complete their portion of the work by the end of next year.

## Large "English Electric" Turbo-Alternators.

The accompanying picture provides an interesting indication of present activity in the building of power station units of large size. Both of the alternator stators are for complete 3,000-r.p.m. steam turbine and alternator sets in course of manufacture at the Rugby and Stafford works of the English Electric Co., Ltd. The stator in the foreground is for the 37,500-kVA set which is being constructed for West Ham to the specification of Mr. F. W. Purse, the borough electrical



**Two Large "English Electric" Stators.**

engineer. The turbine for this set will have a high-pressure cylinder and two low-pressure cylinders exhausting into a single-body "English Electric" condenser, which will be the largest of its type so far produced at Rugby, with a weight of some 100 tons. The second stator is for the 31,250-kVA turbo set under construction for Leicester Corporation, to the specification of the electrical engineer, Mr. J. Mould. An "English Electric" set practically identical with the last-mentioned one was recently ordered by Sheffield Corporation.

## Catalogues Wanted.

Messrs. A. J. TARRANT & Co., William Street, Burton Latimer, ask for catalogues of electrical fittings and apparatus.

## American Radio-Gramophone Deal Abandoned.

It is reported that the suggested merger of the Radio Corporation of America and the Columbia Graphophone Co. has been abandoned in view of the United States law regarding trusts.

## Wages in the Engineering Industry.

At a conference of representatives of trade unions connected with the engineering industry held in London last week, it was decided that an immediate application should be made to the Engineering and Allied Employers' Federation for an early conference to resume consideration of the Unions' application of February 1928, for an increase of 8s. per week for time workers, with a corresponding increase for piece workers.

## Central Electricity Board Contracts.

The Central Electricity Board has placed contracts amounting to approximately £300,000 for work in connection with three electricity schemes as follows:—

*South-East England Scheme:* Secondary transmission lines.—Messrs. Watsham's, Ltd.

*Central England Scheme:* Secondary transmission lines.—Messrs. Watsham's, Ltd.

*North-West England and North Wales Scheme:* Secondary transmission lines.—Messrs. Siemens Bros. & Co., Ltd.; Messrs. John Collier & Co., Ltd. Secondary transformers.—English Electric Co., Ltd.

Messrs. SIEMENS BROS. & Co., LTD., inform us that their contract covers approximately 100 miles of double-circuit 33,000-V transmission lines, consisting of steel-cored aluminium conductors carried on fabricated steel towers. The line embraces the districts of Carlisle, Workington, Whitehaven, Egremont and Penrith.

In our advertisement pages to-day the Central Board invites tenders for the supply, delivery and erection of indoor and outdoor switchgear for the North-West England and North Wales Electricity Scheme.

## Swedish Installation Material Regulations.

As from January 1st, 1930, all electrical installation equipment used in Sweden must be made in accordance with the standards established by the Swedish Government. After that date only approved material bearing the Government stamp "S" may be used.

## Aluminium Prices.

It is stated that, contrary to earlier reports concerning the recent meeting in London of the representatives of the European Aluminium Syndicate of the intention of the Syndicate to raise the price, it was decided to make no change in the price which has remained in force since May, 1928. It was recognised as being advantageous to continue a steady price policy so as to extend the consumption of the metal.

## Registered Electrical Contractors.

Applications for registration from the following were accepted by the Executive Committee of the National Register of Electrical Installation Contractors at its last meeting:—

Podmore, C. J., Stoke-on-Trent.
Maddocks, E. S., Urmston, nr. Manchester.
Girdler, E., Mitcham, S.W.16.
Shrosbery, Bakewell & Co., Ltd., Colchester.
Bush, E., & Co., Bradford.
Sothers, C. A., Ltd., Birmingham.
Forrest & Webb, Handsworth, Birmingham.
Taylor, P., Taunton.
Burrell, R. C., Harrogate.
Law & Carruthers, Bury.
Troy, F., & Co., Ltd., Hampstead, N.W.3.
Nicholson & Ade, Eastbourne.
York, W. H., Kings Heath, Birmingham.
Collins, C., London, S.W.1.
McMaster, Malcolm, Belfast.
Belshaw & Co., Ltd., London, S.W.1.
Allan Holt Electrical & Sanitary Engineering Co., Belfast.

At the same meeting one application was withdrawn and 10 were declined.

## Illumination Design Course.

Although the programme of the 19th Illumination Design Course, which is to be held at the London Lighting Service Bureau from June 10th to 14th, follows the general scheme of its predecessors, it incorporates much that is new. The course will cover a varied and interesting field, and should be considered worth while by all who have to deal with illumination problems. No fee is charged to members of the electrical trade. Inquiries regarding the course should be addressed to the Bureau, 15, Savoy Street, Strand, W.C.2.

## Reported Dutch-German Lamp Agreement.

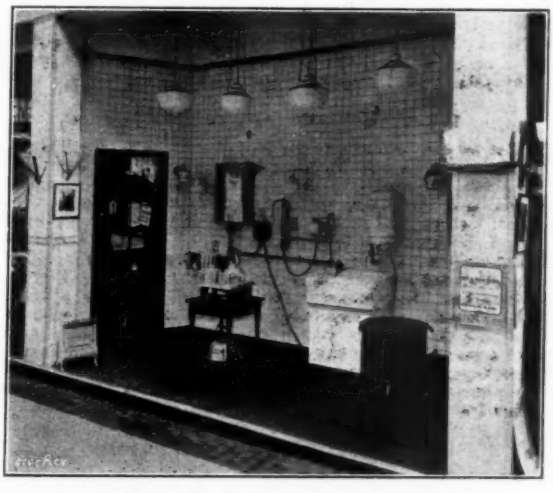
A report is in circulation in Amsterdam financial circles to the effect that the Philips Glow Lamp Company, Eindhoven, has entered into an agreement with the German makers of lamps and radio apparatus under which mutual competition is to be avoided.

## The New F.B.I. Headquarters.

The contract has now been signed for the erection of the new building of the Federation of British Industries on a site in Tothill Street, Westminster, upon which work will begin at once. The building will be entirely built by its future owners—in other words, all the firms engaged in the manufacture of materials for the construction of the building are members of the F.B.I., from Messrs. J. Laing, the contractors, down to the firm supplying the smallest article. The building will have a frontage of 90 ft. and a height to the roof of 80 ft.

## A "Brighter Homes" Exhibition.

As would be expected from its title, the Brighter Homes Exhibition at the City Hall, Manchester, which concluded yesterday after a fortnight's run, included a great deal of



**A Metro-Vick Stand at Manchester.**

electrical equipment. Among the exhibitors were the Manchester Corporation Electricity Department, Electrolux, Ltd., the Hurley Machine Co., Frigidaire, Ltd., and Metro-Vick Supplies, Ltd. A part of the stand arranged by the last company is depicted herewith. It displays a number of kitchen and bathroom appliances arranged in a very effective manner. The company also exhibited many examples of lighting fittings, radio apparatus, and domestic equipment, and gave daily demonstrations of electric cooking and other operations.

D

## New Catalogues and Lists.

The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—A priced and illustrated catalogue of "Magnet" lampholders.

Carrington Manufacturing Co., Ltd., "Camco" Works, Sanderstead Road, South Croydon.—A booklet containing illustrations, particulars and prices of "Camco" cabinets for wireless sets.

The Electric Heating Co., George Street, Croydon.—Two illustrated leaflets advertising the "Elect" boiling ring and the standard "Junior" iron.

Mawdsley's, Ltd., Dursley, Glos.—An illustrated blotter and folder dealing with squirrel cage motors.

Siemens Electric Lamps & Supplies, Ltd., 38-39, Upper Thames Street, E.C.4.—List No. 201, containing illustrations and prices of electric fans of various designs.

The Electrical Equipment & Carbon Co., Ltd., 107, 109 and 111, New Oxford Street, W.C.1.—A brochure describing very fully "Devoorde" patent electric scaling equipments. Illustrated.

Automatic Telephone Manufacturing Co., Ltd., Strowger Works, Liverpool.—A well-produced pamphlet describing and illustrating the A.T.M. Doignon Baudot multiplex apparatus.

Korting & Mathiesen Electrical, Ltd., 711 & 715, Fulham Road, S.W.—A copy of the company's house journal, "The Kandem Quarterly Review," dated April, 1929, describing with illustrations, "Kandem" lighting fittings for commercial, industrial and street lighting.

London Electric Wire Co. & Smiths, Ltd., Playhouse Yard, Golden Lane, E.C.—A leaflet advertising "Lewcos" wires and cables.

Mr. M. Bobin, 15, Farringdon Avenue, E.C.—Two illustrated and priced pamphlets dealing with "Embob" electric irons, one of which is fitted with a special heat-regulating safety device.

Brookhirst Switchgear, Ltd., Northgate Works, Chester.—A well-produced brochure, describing with illustrations the company's marine control gear, and showing examples installed in various ships.

Electric Art Shades (1928), Ltd., Feering Factory, Kelvedon, Essex.—Price list of lampshades in imitation vellum.

Mavor & Coulson, Ltd., 47, Broad Street, Mile End, Glasgow.—An illustrated leaflet describing two types of gate end switches. Priced.

Higgs Motors, Witton, Birmingham.—A leaflet, describing with illustrations, the company's repulsion induction motors.

Ateliers de Constructions Electriques de Charleroi, 56, Victoria Street, S.W. May stock list of motors, dynamos, transformers, &c. Also a "General Booklet" dealing with the company's works and manufactures.

Gent & Co., Ltd., Faraday Works, Leicester.—Sheet No. 42F, showing weatherproof, watertight, &c., bells, Morse keys, telephones, and other specialities for mines.

A.E.G. Electric Co., Ltd., 131, Victoria Street, S.W.—A stock list of motors of all types and voltages. Priced.

Angelo Bros. (England), Ltd., 45, St. Mary Axe, E.C.—Two booklets on shellac, one dealing with the company's products and other with the physical and chemical examination of shellac.

The Morse Chain Co., Ltd., Letchworth, Herts.—A well-illustrated brochure dealing with Morse silent chain drives in the textile industry, and for small power drives.

Henry Wiggin & Co., Ltd., Wiggin Street, Birmingham.—A descriptive pamphlet giving details of the properties of "Brightray," "Glowray," and "Ferry" resistance alloys.

## Sussex Electrical Contractors' Dinner.

The annual dinner of the Sussex branch of the Electrical Contractors' Association was held at the Old Ship Hotel, Brighton, on May 8th. Mr. H. L. Holford (chairman) presided, and the guests included the Mayor of Brighton (Ald. H. J. Galliers, J.P.), the Mayor and Mayoress of Hove, Mr. W. H. Walton (president of the E.C.A.), Mr. J. Christie, the Brighton electrical engineer, and Mr. C. B. Smith, the Hove electrical engineer. Among the toasts was "The Electrical Contractors' Association," proposed by Councillor Chatfield (Eastbourne), and responded to by Mr. Walton, who said that the Government was providing a transmission "grid" and a load had to be found for it, which meant more installation work for many years to come. Mr. L. C. Penwill (secretary of the E.C.A.) proposed the health of "The Sussex Electrical Engineers," and Mr. J. Christie replied.

## Irish Free State Electrical Imports.

The imports of electrical goods, excluding machinery, into the Irish Free State during March last amounted to £78,968, bringing up the total for the first three months of the year to £150,658, as compared with £119,247 in the corresponding period of 1928.

## New French Companies.

Among the concerns recently formed in France are the Société de l'Energie et Lumière, Rouen, capital 105,000 fr.; La Société Télémécanique Electrique, Nanterre, 20,000,000 fr.; La Société l'Union Electrique Coloniale, Paris (48, Rue de Bienfaisance), 100,000 fr.; and La Société des Transformateurs Sol, Paris (116, Rue de Turenne), 117,000 fr.

## Bankruptcy Proceedings.

L. J. Smith, 16, George Street, Berkhampstead, electrical, radio, and cycle engineer. The receiving order herein was made on April 2nd, on the debtor's own petition. The first meeting of creditors was held recently at 37, Cornmarket Street, Oxford. The following are creditors:—

| | £ | | £ |
|---|---|---|---|
| Shell-Mex, Ltd. ... | ... 83 | Giffin, R. A. ... ... | ... 26 |
| Michelin Tyre Co. ... | ... 21 | Kolster-Brandes, Ltd. | ... 31 |
| Arneways Trust ... | ... 41 | Smith, Gladys ... | ... 77 |

R. Bennett, wireless dealer, lately carrying on business at 107, Devons Road, Bow, E.—The first meeting of creditors was held on May 6th, at the London Bankruptcy Court. The receiving order was made on April 23rd, upon the petition of Brahams (Houndsditch), Ltd., the act of bankruptcy alleged being non-compliance with the requirements of a bankruptcy notice. It appeared that the debtor had not yet attended under the proceedings, and nothing was known regarding liabilities or assets. The proofs of debt had been lodged, and the case was left in the hands of the Official Receiver to be wound up in the usual manner.

J. G. Ritchie, 54, Woodsley Road, Leeds, electric lamp dealer.—The adjourned public examination herein was held recently at the County Court House, Leeds. The statement of affairs previously produced showed a deficiency of £81, and the debtor attributed his failure to the cost of an action against him for an injunction with reference to an alleged infringement of patent rights. The Registrar ordered the debtor to file papers referring to the matter by a certain date, and adjourned the examination.

J. Stirzaker, electrical engineer, Wen Roe, Llanfairfechan.—Receiving order made May 1st, on debtor's own petition.

J. H. McBean, electrical engineer, 29, Bradford Road, Batley Carr.—Receiving order made May 3rd, on debtor's own petition.

E. R. Millward (West of England Radio), wireless engineer), 67, High Street, Barnstaple.—First meeting held May 14th, at the Official Receiver's offices, Exeter Bank Chambers, Broadgate, Exeter; public examination, June 4th, at the Guildhall, Barnstaple.

W. R. J. White, electrical agent, Golden House, 29, Great Pulteney Street, W.—Last day for proofs for dividend, May 28th. Trustee, Mr. D. Williams, Official Receiver, Carey Street, W.C.

E. Temple (separate estate) (Westoe Electrical Co.), electrical contractor and wireless dealer, 105, Canterbury Street, South Shields.—Last day for proofs for dividend, May 22nd. Trustee, Mr. A. J. Gray, 48, Pilgrim Street, Newcastle-on-Tyne.

H. Pevver, electrical apparatus and tool merchant, Market Lane, Newcastle-on-Tyne.—Receiving order made May 6th on debtor's own petition.

E. E. Harrison, electrician, 27, School Lane, Heaton Chapel.—Receiving order made May 8th, on debtor's own petition.

H. Savory, electrical engineer, 7a, Hill Street, Shaw, Lancaster.—Last day for proofs for dividend, May 25th. Trustee, Mr. J. D. Turner, Official Receiver, Byrom Street, Manchester.

## Company Liquidations.

Earlsdon Radio Supplies, Ltd.—A petition for the winding up of this company has been presented to the County Court of Nottinghamshire, held at Nottingham, by Burgoyne Wireless, Ltd., of 34a, York Road, King's Cross, N., creditors, and will be heard at Nottingham on June 20th.

Young Accumulator Co., Ltd.—Winding up voluntarily for reconstruction purposes. Liquidator, Mr. E. J. Bettson, 274, Gresham House, E.C. Meeting of creditors at the liquidator's offices, May 21st. Particulars of claims by June 14th. (This notice is purely formal; all creditors have been or will be paid in full.)

## Private Arrangements.

Herbert Lyons, trading as J. Lyons, electrical and wireless engineer, 300, Willesden Lane, N.W.2.—In response to a circular letter issued by Messrs. Phillip L. Causley & Co., 70, Hatchard Road, N., a meeting of creditors was held on May 6th in London. The statement of affairs as at April 30th last showed liabilities of £577, and assets of £246, leaving a deficiency of £331. It was stated that the debtor was previously in a partnership, and then started trading on his own account. There were various contracts and other work, and it was thought that the business could be carried on successfully in the future. On May 2nd last, a company, called J. Lyons, Ltd., was formed to take over the assets as a going concern. Certain of the cash creditors were taking shares in the company, which was willing to make arrangements to pay the other creditors in full. The debtor was being allotted fully-paid shares in the company, and the company offered deferred notes to the creditors which would be redeemable over 12 months, with a reasonable rate of interest. A resolution was passed in favour of the matter being dealt with in bankruptcy. The following are creditors:—

| | £ | | £ |
|---|---|---|---|
| Tungstalite, Ltd. ... | ... 102 | Young & Wildsmith | ... 32 |
| Supra Electrical Co. | ... 39 | | |

## Unemployment.

The Ministry of Labour returns showed an increase of 23,078 in the number of registered unemployed during the week ended April 29th. The total at that date was 1,163,800, as compared with 1,140,722 on April 22nd, and 1,136,003 on April 30th, 1928.

## A New Siemens Branch.

In order to cope with increasing business, SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., has opened new branch premises at 4, Castle Boulevard, Nottingham (telephone: Nottingham 3110). The new premises, which are illustrated herewith, will embody a trade counter, showroom facilities, and stores in

New Siemens Branch at Nottingham.

the same building. Adequate stocks will be carried of lamps, fittings, accessories, "Xcel" domestic appliances, "Zed" fuse material, v.i.r. wires and cables, h.t. batteries, dry cells, telephones, and B.R.V.M.A. radio valves.

## Book Notices.

Publication of the Bureau of Information on Nickel, Ltd.: "Nickel Cast-iron," by Prof. D. Hanson, D.Sc.—This paper formed the subject of a lecture to the Institute of British Foundrymen in November last; it describes the technical basis of the applications of nickel in cast-iron, as developed from the research work carried out at Birmingham University.

"Steam Turbines," by T. M. Taylor. Pp. viii+207; figs. 171. London: Chapman & Hall, Ltd. Price 12s. 6d. net.

"Engineering Economics," by T. H. Burnham. Pp. viii+326; figs. 11. London: Sir Isaac Pitman & Sons, Ltd. Price 10s. 6d. net.

## Lighting on the Mumbles Railway.

SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., informs us that all the new cars on the recently-electrified Swansea and Mumbles Railway are lighted by means of "Silvalux" gas-filled opal traction lamps.

## Trade Announcements.

Messrs. MAYALL & Co., LTD., Birmingham, have opened a branch stores at 5a, Beast Fair, Pontefract.

The HOLLAND HOUSE ELECTRICAL CO., LTD., has removed from 247a to 217, St. Vincent Street, Glasgow, with stores at 128, St. Vincent Lane. The telephone number (Central 7048) is unaltered.

New offices at St. Neots have been opened by the BEDFORDSHIRE, CAMBRIDGESHIRE AND HUNTINGDONSHIRE ELECTRICITY CO.

The address of RADIO INTELLIGENCE, LTD., is now Marconi House, Strand, W.C.2.

Mr. L. VANDERVELDE has removed to larger premises at 35, Minories, E.C.3. (Telephone: Royal 1261; telegrams: "Splittings, Ald, London.")

## For Sale.

The Cheadle and Gatley Urban District Council has for sale a quantity of demand indicators. The East Suffolk Electricity Distribution Co., Ltd., has for disposal one 16-kW and one 24-kW generator, meters, motor booster and battery. (See our advertisement pages to-day.)

## Local Exhibition.

HOVE.—On May 8th the Mayoress opened an electrical exhibition at the Hove Street showrooms organised jointly by the Hove Electricity Department and local registered contractors. During the exhibition, which ran for a week, daily demonstrations of electric cooking, washing, &c., were given.

## An E.D.A. Lecture.

On May 8th, at the Midland Hotel, Manchester, Mr. C. H. Rayner, sales manager, Manchester Corporation Electricity Department, delivered a lecture to the Manchester branch of the Incorporated Sales Managers' Association. This was a repetition of a lecture drawn up in pamphlet form by the British Electrical Development Association. An interesting discussion followed. Several speakers touched upon the all-absorbing topic of price, and the lecturer appealed to his audience not to believe that the "halfpenny unit" was almost within reach throughout the entire kingdom. The Battersea and Barton stations came in for severe criticism on the subject of fumes, but Mr. Rayner appeared to convert many of his hearers to the belief that the domestic chimney was the chief malefactor in creating the smoke pall which hangs over most of our large cities and towns. Mr. Blany, a visitor from New Zealand, and Mr. J. W. Price, chairman of the meeting, contributed to the discussion.

## Showroom Site Dispute at Leicester.

At a recent meeting of the Leicester City Council the Electricity Committee put forward a proposal to purchase a site for offices and showrooms at a cost of £28,500. Objections were made that the proposed expenditure was too great and an amendment was moved and carried calling upon the Committee to choose a site already owned by the Corporation.

## Our Foreign Electrical Trade.

The following table shows the values of exports and imports of electrical goods and machinery during April, 1929:—

| | £ | £ | £ |
|---|---|---|---|
| *Exports*— | | | |
| Electrical goods and apparatus ... ... ... ... | 1,163,890 | +235,658 | − 14,573 |
| Machinery ... ... ... | 4,150,722 | + 7,369 | −342,949 |
| (Inc. electrical machinery) | 510,344 | + 9,085 | − 65,144 |
| *Imports*— | | | |
| Electrical goods and apparatus .. ... ... ... | 397,260 | + 91,573 | +220,740 |
| Machinery ... ... .. | 1,573,955 | +109,500 | +324,191 |
| (Inc. electrical machinery) | 145,977 | − 2,348 | − 21,355 |
| *Re-exports*— | | | |
| Electrical goods and apparatus ... .. .. ... | 14,226 | + 1,768 | − 1,383 |
| Machinery ... ... ... | 127,271 | − 11,843 | − 6,747 |
| (Inc. electrical machinery) | 11,845 | − 2,531 | − 8,819 |

## "Hoover" Window Displays.

In a window display competition recently arranged by Hoover, Ltd., the first prize was awarded to Messrs. Edward Dewhurst, Ltd., Preston, the second to Messrs. Lambert Brien and Co., Ltd., Dublin, and the third to Messrs. Parker, Winder and Achurch, Ltd., Birmingham.

## Sir Hugo Hirst on Australia.

A further review of Australian conditions and the work of the British Economic Mission was made by Sir Hugo Hirst, Bt., at a British Engineers' Association luncheon last week. He said that the Commonwealth had a national debt of about £1,100 millions, more than half of which was due to Australians themselves. About 75 per cent. of the debt was reproductive and it was ridiculous to doubt the financial stability of the Commonwealth. One matter which needed attention was the lack of knowledge of British industry in Australia, as compared with what was known regarding American industry. It was our duty to see that our scientists and engineers studied Australian conditions and co-operated with Australians. So far as the electrical market was concerned Canada had been lost to the United States, but Australia desired to purchase British goods. A great deal of trade was, however, going to America which should be in British hands and it should be our aim to divert it.

## Electrical Education.

The British Electrical Development Association has sent us a reprint of a report by Major E. A. Barker, borough electrical engineer of Barnsley, on the use of electricity in school domestic centres. This matter was referred to in our issue of March 29th (p. 587) when we reproduced the bulk of the report and some of the illustrations.

## Departmental Opinions on the Liberal Report.

A White Paper has been issued in which the development proposals put forward by the Liberal Party are considered in detail by the Ministers in charge of the Departments concerned with the various branches. Dealing with the subject of electrical development, Col. Wilfrid Ashley, Minister of Transport, points out that the principal difficulty in speeding up expenditure upon the distribution system is to give undertakers confidence that they will receive a reasonable return upon their investment in a short time. He considers that the Liberal report deals very vaguely with the means by which this is to be achieved. After stating that too rapid extension of distribution might lead to the further development of generation on the wrong lines, Col. Ashley says that the Electricity Act of 1926 adopted the logical sequence of development. That Act provides for a proper main distribution system to enable generation to be conducted in the most efficient way, and then an increase (on the present normal though marked annual expansion) of the distribution systems to dispose of the energy so produced. The Liberals' telephone proposals are dealt with by the Postmaster-General (Sir W. Mitchell-Thomson). In his opinion the finance of the scheme is radically unsound. There is no reason to believe that within the next two or three years such large numbers of people as is suggested will be found willing to rent telephones except at rates below cost. Already about a million pounds a month is being spent on new capital works. If

considerably more was expended either the new plant would remain idle or its use would have to be offered to subscribers at rates which would not cover the cost. "In either case the telephone service would have to be subsidised by the taxpayer and the excess capital, however it was raised, would in effect be withdrawn from other industries where it might be more usefully employed."

### Prices of Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

| | CHEMICALS, &c. | | Price May 14th. | Fortnight's inc or dec. |
|---|---|---|---|---|
| a | Acid, Oxalic ... ... ... ... | per lb. | 5½d. | ... |
| a | Ammoniac, Sal ... ... ... | per ton. | £60 | ... |
| a | Ammonia, Muriate (large crystal) | ,, | £52 | ... |
| a | Bisulphide of Carbon ... ... | ,, | ... | ... |
| a | Borax ... ... ... ... ... | ,, | £25 | ... |
| a | Copper Sulphate ... ... ... | ,, | £26 10s. | ... |
| a | Potash, Chlorate ... ... ... | per lb. | 3½d. to 4d. | ... |
| a | ,, Perchlorate ... ... | ,, | 5½d. | ... |
| a | Shellac ... ... ... ... | per cwt. | £18 10s. | ... |
| a | Sulphur, Commercial ... ... | ,, | £11 | ... |
| a | ,, Roll ... ... ... | ,, | £11 | ... |
| a | Soda, Chlorate ... ... ... | per lb. | 3d. | ... |
| a | ,, Crystals ... ... ... | per ton. | £5 to £5 5s. | ... |
| a | Sodium Bichromate, casks ... | per lb. | 3½d. | ... |
| | METALS, &c. | | | |
| b | Aluminium, Ingots ... ... | per ton. | £95 to £100 | ... |
| b | ,, Wire ... ... ... | per lb. | 1/1 to 1/9 | ... |
| b | ,, Sheet ... ... ... | ,, | 1/1 to 2/9 | ... |
| p | Babbitts Metal and Anti-friction Metal— | | | |
| | Grade I ... ... ... | per ton net. | £182 | ... |
| | Grade II ... ... ... ... | ,, ,, | £128 | ... |
| | Grade III ... ... ... ... | ,, ,, | £71 | ... |
| a | Brass (rolled metal 3" to 12" basis) | per lb. | 10½d. | ... |
| c | ,, Tubes (solid drawn) ... ... | ,, | 1/1 to 1/1½ d. | ... |
| a | ,, Wire, basis ... ... ... | ,, | 11d | ... |
| c | Copper Tubes (solid drawn) ... | ,, | 1/3½ | ... |
| a | ,, Bars (best selected) ... | per ton. | £112 | ... |
| a | ,, Sheet ... ... ... | ,, | £112 | ... |
| a | ,, Rod ... ... ... ... | ,, | £112 | ... |
| d | ,, (Electrolytic) Bars ... | ,, | £84 | ... |
| d | ,, ,, Sheets ... | ,, | £143 10s. | ... |
| d | ,, ,, Wire Rods | ,, | £94 | ... |
| d | ,, ,, H.C. Wire | per lb. | 11d | ... |
| f | Ebonite Rod ... ... ... ... | ,, | 2/8 to 2/6 | ... |
| f | ,, Sheet ... ... ... | ,, | 2/8 to 2/6 | ... |
| n | German Silver Wire ... ... | ,, | 2/2 | ... |
| h | Gutta-percha, fine ... ... ... | ,, | nom. | ... |
| h | India-rubber, Para fine ... ... | ,, | 11½d. | 1½d. inc. |
| d | Iron Pig (Cleveland No. 3.) ... | per ton. | 68/6 | ... |
| d | ,, Wire, galv. No. 8, P.O. qual. | ,, | £21 | ... |
| g | Lead, English pig ... ... ... | ,, | £25 5s. | 15s. dec. |
| g | Mercury ... ... ... ... | per bot. | £22 3s 6d. to £22 5s. | ... |
| e | Mica (in original cases) small ... | per lb. | 3d. to 3/- | ... |
| e | ,, ,, medium | ,, | 4/- to 8/- | ... |
| e | ,, ,, large ... | ,, | 10/- to 20/- & up | ... |
| p | Phosphor Bronze, plane castings | ,, | 1/3½ | ... |
| p | ,, ,, drawn bars & rods | ,, | 1/5 | ½d. dec. |
| p | ,, ,, rolled strip & sheet | ,, | 1/3½ | ½d. dec. |
| p | ,, ,, wire... ... ... | ,, | 1/8½ | 1½d. dec. |
| o | Platinum ... ... ... ... | per oz. | £13 17s. 6d. | ... |
| d | Silicium Bronze Wire ... ... | per lb. | 1/3 | ... |
| r | Steel, Magnet, in bars ... ... | ,, | 7½d. | ... |
| n | Tin, Block (English) ... ... | per ton. | £199 5s. to £199 15s. | £1 inc. |
| n | ,, Wire, Nos. 1 to 16 ... ... | per lb. | 8/11 | ... |

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd
p C. Clifford & Son, Ltd.
W. F. Dennis & Co.

Reporting on May 11th, Messrs. James Forster & Co. stated that quiet conditions again prevailed in the lead market last week. Prices for forward lead scarcely moved from day to day, but the May position, owing to declarations of American lead, became a trifle easier. Demand, both in this country and on the Continent, shows no signs of reviving, while arrivals are not excessive, but sufficient for requirements. These conditions seem likely to continue, resulting in continued quiet and rather stagnant markets, until some new factor arises to alter the present position of supply and demand.

# Lighting and Power Notes.

**Aberdeen.**—Grampian Bill Opposition Withdrawn.—The Corporation Electricity Committee reports that a sub-committee has adjusted a clause with the promoters of the Grampian Electricity (Supply) Bill, now before Parliament, for the protection of the Corporation, and that, as a result, the Corporation's opposition to the Bill has been withdrawn.

**Aldershot.**—Loan.—The Town Council has applied for sanction to a loan of £4,560 for the provision of an additional 1,000-kW set at the electricity works.

**Barnstaple.**—Loan.—The Town Council has applied for sanction to a loan of £6,750 in connection with the installation of a 300-kW Diesel generating set.

New Showroom.—The Lighting Committee is to prepare a scheme for a showroom for electrical fittings and appliances.

**Birmingham.**—Electrical Development.—In a report to the City Council the Electric Supply Committee has asked for authority to incur an expenditure of £600,000—£300,000 for mains and £300,000 for additions to the sub-station system. The Committee states that the sum of £561,000 sanctioned in December, 1927, to meet extensions to the end of March, 1929, has proved to be sufficient, and the cash balance in hand is required to meet commitments. Further capital is now required to provide for the continued growth in the demand for electricity supplies, both within the city and in the area of the Council's supply beyond the city boundary. The capital expenditure on mains of all classes, including trunk mains, during each of the past five years was:—Year ended 1925, £289,042; 1926, £357,870; 1927, £438,010; 1928, £260,596; 1929 (estimated), £450,000. The number of additional consumers connected during the same period was during the year ended 1925, 5,521; 1926, 8,905; 1927, 10,307; 1928, 9,753; and 1929, 11,076. It is estimated that the expenditure now proposed will meet the requirements for mains and sub-station equipment up to the end of December, 1930. The Committee's proposals were approved at a meeting of the Council on May 7th.

**Blackburn.**—Change-Over.—The Town Council has received consent to the change-over from d.c. to a.c. in certain districts of the borough.

**Burton-on-Trent.**—Loan.—The Corporation Electricity Committee is seeking sanction to the borrowing of £10,000 in connection with the assisted wiring scheme.

**Canada.**—Hydro-Electric Development.—The Gatineau Power Co., one of the units of the Canadian Hydro-Electric Corporation, Ltd., controlled by the International Hydro-Electric System, a subsidiary of the International Paper & Power Co., has put into operation the second 25,000-h.p. generator in its Bryson, Quebec, hydro-electric plant which is designed for 75,000 h.p. With the starting of the second generator in the Bryson power-house, the Gatineau Co. now has hydro-electric plants on the Ottawa river and its tributaries with an aggregate installed capacity of 562,600 h.p. Of this, 436,000 h.p. is in the hydro-electric plants on the Gatineau river.

**Colchester.**—Bulk Supply.—The following terms have been offered to the Walton-on-Naze Urban District Council for a supply of electricity in bulk:—Walton to agree to make provision to receive at a pressure of 11,000 V a minimum of 100 kVA and 120,000 kWh per annum. The charge is to be: First 100 kVA and 120,000 kWh in any one year, £5 per kVA and 0.8d. per kWh; next 100 kVA and 120,000 kWh, £4 15s. and 0.75d. per kWh; next 100 kVA and 120,000 kWh, and beyond, £4 10s. and 0.7d. per kWh. The agreement is to be for 25 years, with quinquennial reconsideration of the prices.

**Crewe.**—Loan.—The Town Council has applied for sanction to a loan of £15,000 for electricity extensions.

**Dewsbury.**—Loan.—The Town Council has applied for sanction to a loan of £10,000, for mains and services.

Assisted Wiring Scheme.—The decision of the Electricity and Tramways Committee to take no action in setting up its own department for the wiring of houses in connection with the assisted wiring scheme has been confirmed.

Bulk Supply.—The Yorkshire Electric Power Co. has given notice to terminate, on March 31st next, the existing agreement with the Corporation for a bulk supply of electricity, but offers to withdraw the notice and amend the charges from that date on the basis of the company's prevailing bulk supply tariff. The Corporation Electricity Committee has asked the borough electrical engineer and the borough treasurer to go into the matter and report.

**Doncaster.**—Loan.—The Corporation is applying for sanction to a loan of £3,470 for extending the electricity supply to the Intake housing estate.

**Eastbourne.**—Mains Extensions.—The Corporation Electricity Committee has decided to extend mains to Willingdon and Wannock at a cost of £5,832.

**East Ham.**—Loans Sanctioned.—The Corporation Electricity Committee has obtained sanction to loans of £3,500 for buildings, £5,526 for mains and £15,000 for plant.

**Exeter.**—Electrical Development.—At a meeting of the City Council on May 7th, the chairman of the Electricity Committee said that ten years ago the number of consumers was 2,200; last year it was 7,200. Two million kWh was sold in 1919, as compared with six millions last year. The revenue had increased from £22,000 to £73,000, and the station capacity from 2,000 kW to 11,500 kW. He hoped to make an announcement shortly regarding a decision under which the Council would secure business that in a few years would take practically half the present output of its station. The matter, however, was not yet sealed.

**India.**—Calcutta.—To meet the increased demand for electricity anticipated in 1930, the Calcutta Electric Supply Corporation is inviting tenders for a 15,000-kW turbo-alternator. It

is destined for the southern generating station at Cumberbatchies Point. The mains are being extended further into the country and electricity will shortly be available in the Serampore district where the Municipality is considering the lighting of streets electrically. The supply available at Serampore will be almost doubled by a further scheme on which the Corporation is embarking. This involves carrying another main along the Calcutta side of the river, and linking it up with the new system south of the Municipality. Other important plans include the extension of electricity across the Hooghly.

**Isle of Wight.**—SPECIAL ORDER.—At a conference of local authorities of the Isle of Wight, it was recommended that they should support an application by the Isle of Wight Electric Light & Power Co., Ltd., for a Special Order to cover that portion of the island now covered by the existing local Orders, subject to the terms of the agreement to be entered into to this effect being approved by the local authorities concerned.

**Japan.**—ELECTRICAL DEVELOPMENT.—The Tenryugawa Electric Power Co., Ltd., has recently completed a new hydro-electric power station with a capacity of 25,000 kW at Minamimuki. The Great Consolidated Electric Power Co., Ltd., is planning to construct a large reservoir on the Kiso River to increase the generating capacity at the Kiso River plants. When all power plants on the Kiso River are completed the total generating capacity will be 370,000 kW.

**Lancaster.**—LOAN.—Application is being made by the Corporation Electricity Committee for sanction to the borrowing of £27,000 for two new boilers at the Caton Road generating station.

**London.**—BERMONDSEY.—The Borough Council Electricity Committee has prepared loan estimates as follows:—Mains and services, £20,000; meters, £2,500; wiring installations, £7,500.

ST. PANCRAS.—The Borough Council has received sanction to the borrowing of £5,000 on account of the £7,549 applied for in respect of the provision of additional condensing water plant, &c., at the King's Road generating station. The Electricity Commissioners have informed the Council that, before sanctioning further amounts, they desire to have particulars of the pump house buildings, &c., and of the tenders which it is proposed to accept.

FULHAM.—The Electricity and Lighting Committee recommends the expenditure of £6,217 for the provision of three sub-stations, (*a*) on the site of Harwood Road School, (*b*) at the corner of Fulham Palace Road and Bishop's Park Road, and (*c*) in Filmer Road, opposite Munster Road School.

**Luton.**—WAYLEAVES.—In connection with the inquiry held on April 8th into the application of the Corporation for compulsory wayleaves for an overhead line required to supply electricity to the Zoo being established at Whipsnade, the Minister of Transport has granted the Corporation's application on condition that where the line crosses the property of the National Trust it shall be underground.

**Newark.**—ELECTRICAL DEVELOPMENT.—Owing to the increasing demand for electricity the Town Council has decided to install a new 500-kVA transformer with switchgear, &c., at a cost of £747. The Council also decided to extend the l.p. mains to supply the 116 houses which it is erecting in Bowbridge Road at a cost of £1,155. The houses are to be wired by the Council.

**Northern Ireland.**—OMAGH (CO. TYRONE).—At a recent meeting of the Urban District Council, Mr. P. A. Spalding, consulting engineer, Dundalk, submitted a report on the proposal to install a municipal electricity supply in the town. He stated that the initial capital cost of a complete scheme for supplying the urban area, using overhead lines, and providing steel poles in the principal streets, should not exceed £10,000. The charge of 9d. per kWh for lighting would ensure a safe margin of profit. The Finance Committee recommended that the Council should engage Mr. Spalding to draw up a scheme for the lighting of the town, and to act generally as the Council's consulting engineer during the proceedings in connection with the application for powers to install the plant and to obtain the necessary loan.

**Odiham (Hants.).**—OVERHEAD LINES.—Mr. A. D. Erskine, on May 4th, held a Ministry of Transport inquiry into the application of the Aldershot Gas, Water and District Lighting Co., to use overhead lines for the supply of electricity in the rural area. The principal objectors were A. J. Parsons, Ltd., on whose farm it is proposed to erect twenty poles, and Mr. Spencer Charrington, a landowner at Winchfield, whose objections were mainly against the company's agreement. For the company it was stated that the proposed route was from the sub-station at Fleet to a sub-station to be erected at Hook, which would eventually be used by the Central Electricity Board for a switching station. The lines would carry 11,000 V. The County Council and the Fleet Urban District Council had given consent, and the Hartley Wintney Rural District Council would do so providing underground cables were used in Odiham.

**Ormskirk.**—BULK SUPPLY.—A sub-committee of the Urban District Council has been negotiating with the Central Electricity Board for a bulk supply of electricity to its area. The report of the sub-committee has been approved and the Town Clerk has been instructed to carry out its recommendations.

**Peterborough.**—WIRING SCHEME.—The Town Council has adopted a scheme of hire purchase for the wiring of the smaller type of houses. A deposit of 2s. 6d. per £1 of the cost will be payable, and the balance will be repaid by quarterly payments of 1s. 2d. per £1.

**Preston.**—ANNUAL POWER STATION INSPECTION.—Members of the Electricity Committee recently undertook their annual inspection of the Ribble power station and the various distribution plant in the area. It was stated by the chairman that when the Ribble station was completed it would have a capacity of approximately 60,000 kW. On the distribution side the Corporation had spent £250,000, and had laid 155 miles of cable. The expenditure on transmission lines amounted to £200,000 and on miscellaneous administrative details £50,000.

**Price Reductions.**—Reductions in the charges for electricity have been made or recommended in the following districts:—

TORQUAY.—The fixed rate for Council houses from 1s. 3d. to 1s. 1d. per week.

CONNAH'S QUAY.—Lighting: From 8d. to 7d. per kWh. Heating and cooking: From 3d. to 2½d. per kWh.

DARWEN.—Domestic rates for lighting during summer quarters: From 5½d. to 5d. per kWh for less than 30 kWh, and from 5d. to 4½d. per kWh in excess of this amount. Domestic power, heating and cooking: A reduction of ¼d. per kWh for over 30 kWh per quarter. Large industrial consumers: Over 100 kWh up to 500 kWh, from 2½d. to 2d., second 500 kWh from 1½d. to 1 9/16d., second 1,000 kWh from 1¼d. to 1 3/16d., over 4,000 kWh from ¾d. to 13/16d. per kWh. Contracts are subject to 27½ per cent. discount instead of 22½ per cent. Late shop window lighting, 2½d. per kWh, conditional on paying 10s. per quarter for meter rent and time switch.

**Rugby.**—COMMERCIAL TARIFF.—The Urban District Council has adopted the following commercial tariff:—Power: l.p. supply, 1½d. per kWh, with a minimum charge for 72 kWh per quarter per h.p. installed; h.p. supply (by agreement), below 50,000 kWh per annum, 1.375d. per kWh; between 50,000 and 250,000 kWh, 1.25d. per kWh; beyond, 1.2d. per kWh. Business premises: lighting, 4½d. per kWh; cooking, 1d. per kWh; heating, controlled by time switch to keep off peak load, 1d. per kWh.

**Scarborough.**—BULK SUPPLY.—The Town Council is negotiating with the Electricity Commissioners and the Central Electricity Board for a bulk supply to Bridlington.

**Special Orders.**—Application has been made to the Electricity Commissioners for a Special Order by the Holderness Trust, Ltd., authorising it to supply electricity in the urban districts of Great Driffield and Pocklington, the rural districts of Bridlington, Driffield, Norton and Sherburn, the rural district of Pocklington (except the township of Cottingwith), and certain parishes in the rural district of Beverley.

The following Special Orders made by the Commissioners have been confirmed by the Minister of Transport: Hope (Derbyshire) and District; and Dumfriesshire (Gretna and Dornock).

**Tonbridge.**—EXPERIMENTAL TARIFF.—The Urban District Council has introduced the following new tariff for electricity for lighting and power, which is to be tried for a year:—A fixed charge of 20 per cent. per annum of ratable value, with a minimum charge of £2, plus 1d. per kWh.

**Torquay.**—ELECTRICITY SUPPLY.—In view of the wish expressed by the Totnes Rural District Council that the Corporation should become the electricity undertaker for the whole of that rural district, the Corporation is to oppose the application which is being made by Mr. W. G. Heath for a Special Order authorising him to supply the urban district of Ivybridge and certain parishes in the Kingsbridge and Totnes rural districts in so far as that order affects the last named rural district, and to apply for a Special Order extending the Corporation's area of supply so as to include the whole of the Totnes rural district, instead of part as at present.

PURCHASE OF UNDERTAKING.—An agreement has been arrived at between the Corporation and the Teignmouth Electric Lighting Co., Ltd., for the purchase by the former of the Buckfastleigh electricity undertaking, at a cost of £10,500, subject to the sanction of the Electricity Commissioners.

**Worcester.**—LOAN.—The City Council is to apply for sanction to a loan of £12,500 for l.p. mains.

# Tramway and Railway Notes.

**Birmingham.**—ABANDONMENT OF TRAMWAY ROUTES.—The City Council has decided to abandon the tramway tracks in Hagley Road and Bolton Road, and to substitute a motor-omnibus service.

**Continental.**—SWEDEN.—The Minister of Communications has announced in the Riksdag that the main line between Stockholm and Malmoe, 600 km. in length, is the railway that may next be electrified. It has, however, not yet been decided whether the electrification of the Swedish State Rail-

ways should be continued, nor has it been ascertained whether the estimated cost of Kr. 60,000,000, for the electrification of the Stockholm-Malmoe main line and two small lines with a total length of 152 km. connecting it with the already electrified Stockholm-Gothenburg main line, could be recouped by the reduced cost of running and increase in traffic after electrification.—*Reuter's Trade Service* (Stockholm).

**Japan.**—Railway Electrification.—The I.G.R. plans electrifying its lines between Ochnomizu and Kamedo, Yonehara and Imasho, Fukushima and Yonezawa, and Toyooka and Tottovi, the work to be carried out during the period 1929 to 1936 at an estimated cost of 203,115,690 yen.

It has been decided to electrify the Hakatanwan railway between Hakata and Fukuoka, a distance of 14 miles. The cost is estimated at 600,000 yen.

The Ujigawa Electric Power Co., Ltd., which operates an electric railway between Kobe and Himeji, is planning to extend the line as far as Okayama, a city in Okayama Prefecture, a distance of 52 miles.

**Siam.**—Railway Electrification.—According to *L'Industrie Electrique* a proposal is being discussed for the electrification of the Royal railway in Siam. At present the steam locomotives are operated by means of wood fuel, and this is not found satisfactory. The railway authorities, instead of waiting for the execution of the projected hydro-electric works in the north of Siam, will erect a power station in Bangkok with a capacity of 15,000 kW. The boilers will be fired with refuse from the rice fields. The preliminary proposals embody the electrification of 200 km. of railway, and it is possible that the supply of the new plant, and erection of the power house, as well as the conversion of the line, will be entrusted to a single firm by means of international competition. The expenditure is estimated at 80 million fr.

# Telegraph and Telephone Notes.

**Canada.** — Railway Telephony.—Long-distance telephone communication to and from passengers in a Canadian National railway train moving at forty miles an hour has been successfully demonstrated, following experiments in wireless telephony by the company's engineers. The reception was quite distinct at both ends, and the new process eliminated many of the difficulties now experienced with similar voice transmission by the system operating in Germany. The Canadian National Railway proposes the installation of wireless telephone equipment on a number of its trains to enable passengers to keep always in touch with their homes or business offices.—*Reuter's* (Ottawa).

**India.**—Radio Communication.—Our Indian correspondent states that the latest report of the Indian Posts and Telegraphs Department shows progress in the development of wireless installations. The new receiving and direction-finding station near Malir (Karachi) has been completed and tested under working conditions. In conjunction with the remodelled transmitting station at Karachi, it will be used for civil aviation purposes as well as for communication with ships. For both purposes arrangements have been made for the operation of transmitting sets at Karachi by remote control from Malir. At the inland stations the new continuous-wave transmitting sets at Allahabad, Lahore, Quetta, Peshawar, and Nagpore have been completed, and similar work at Mhow is in progress. At the Peshawar telegraph office a new receiving installation has been installed and tested with satisfactory results. A new wireless station has been constructed at Kumaran Island, in the Red Sea, principally for communication with Aden. The aerial systems at Allahabad, Lahore, and Quetta have been completely remodelled to suit new continuous-wave transmitting sets. Special receiving sets have been installed at various stations.

**International Telephony.**—England-Czecho-Slovakia.—The Postmaster-General announces that, as from May 11th, a telephone service became available between London and all parts of Czecho-Slovakia. From the provinces telephone service will continue for the present to be restricted to Zones I and II in Czecho-Slovakia (namely, Bohemia, Moravia, Silesia, and Western Slovakia).

**The Telegraph Service.**—Channel Islands.—The Central Telegraph Office reported last week that telegraph communication with Alderney was interrupted, and telegrams were being sent from the mainland by steamer.

**The Telephone Service.**—Isle of Wight Cable.—The Portsmouth Corporation has reported that a specially-constructed new submarine cable has been laid between Portsmouth and Ryde, which, in conjunction with a new telephone repeater station now being installed at Portsmouth, will afford facilities for direct telephone service between the Isle of Wight and London.

**Uruguay.**—Communication Services.—There are now 6,404 miles of telegraph wires in operation in the South American Republic of Uruguay, or 3.7 miles per 1,000 of the population. The number of telephones in use in the country is 26,915, or 15.7 instruments per 1,000 inhabitants.

# Radio Notes.

**B.B.C. Balance Sheet.**—More Income.—A balance of £123,181 is recorded in the second annual report of the Governors of the British Broadcasting Corporation, covering the year ended December 31st, 1928. The corresponding figure for the previous year was £128,338. The total income last year was over £1,000,000. Licence income fell short of revenue expenditure by £7,560 in 1928, whereas in 1927 there was a balance on this section of the accounts of £27,669. Licences increased during the year by 233,218 to 2,628,392, exclusive of free licences to the blind, which increased from 11,448 to 14,068. The principal items in the balance sheet are: income from licences, £871,763; from publications, £120,635; total income, £1,002,505. Expenditure on programmes, £538,990; plant, power, &c., £160,455; rent, rates, taxes, &c., £77,999; administration, salaries, and expenses, £56,211; total expenditure, £879,324. Expenditure on programmes was 63 per cent. and 17 per cent. for plant and power, approximately the same as in the previous year. The value placed upon the premises, plant, fittings, &c., taken over without payment by the Corporation from the company is £174,938. Additional appropriation from revenue to cover capital expenditure on regional stations totalled £134,167, compared with £110,108 for 1927. A further £31,150 was put to reserve for depreciation and renewals. Total assets are reduced at slightly below £600,000. In 68,000 hours of transmission the percentage of breakdowns was .035, representing an increase of .005 in comparison with 1927, caused by damage to aerials during the November gales.

**Belgium.**—Broadcasting Bill.—Notwithstanding an appeal by the Minister of Railways, the Senate on May 8th voted the adjournment of the debate on the Bill creating a National Broadcasting Institute, which has already passed the Chamber. —*Reuter's* (Brussels).

**Canada.** — Co-operation between the Dominion Government and all provinces in the creation of a permanent system of broadcasting is forecast in an official memorandum laid before the Federal Radio Commission by the British Columbia Government, and made public by the Hon. R. S. Pooley, acting Premier of British Columbia. The views of the province on the future administration of radio are thus summed up, says *World-Radio*: "The Government of British Columbia is ready and willing to enter into negotiations with the Government of Canada and the Governments of the various Canadian provinces with a view to the organisation of radio broadcasting on a basis of public service, by some method that may be mutually agreed upon by the said Governments."

**Research Station.**—Move from Keston.—The B.B.C. has decided to dismantle its experimental receiving station at Keston, which for more than four years has been the centre of important research work. The need for a more satisfactory site and a more efficient station has long been felt, and it has now been decided to erect another research station two or three miles away, near Tatsfield Village, on Botley Hill, close to the main road from Croydon to Westerham, says the *Daily Telegraph*. In future the station will be known as the Tatsfield receiving station, and it is anticipated that it will be ready for use early in July. The main work carried on at the station will consist of checking the performances of B.B.C. stations, locating areas of interference, and checking British and Continental wavelengths. Occasional relaying of programmes from various countries abroad will also be carried on from the new station.

**Switzerland.**—Proposed Reorganisation.—According to an official *communiqué* from the Swiss telegraph administration, the technical committee of experts studying the reorganisation of broadcasting has arrived at the following conclusions, says *World-Radio*. Of the two exclusive wave-lengths available for Switzerland within the broadcast band one should be allotted to German Switzerland, and the second to the French-speaking part of the country. Two high-power stations should be suggested, one in the centre of the canton of Vaud, and one near the See valley for the German-speaking regions. As the two stations would serve only part of the country and, especially, preclude certain important towns, secondary transmitters should be suggested in or near the following towns:—Geneva, Sion (Valais), Berne, Basle, Zürich, St. Gall, Coire, and in the canton of Tessin. The topographical condition of the region round Sion and that prevailing in the Tessin are such that the use of the wave-lengths 680 and 760 metres should be assigned to these stations. The other secondary transmitters should use a common international wave-length. The German-Swiss region should pay for the Tessin transmitter to balance the smaller financial resources of the French-Swiss region. It is accepted that the Confederation will build and operate the transmitters. The authorities have not come to a decision regarding the recommendations of the experts. It is hoped that this summer will see the definite acceptance of reorganisation.

# Contract Information.

**When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.**

## Contracts Open.

**Aughton.**—May 23rd. West Lancashire R.D.C. Electric lighting scheme for the parish. Specifications (£2 2s.) and form of tender from Mr. James Scott, 358, Royal Liver Building, Liverpool.

**Australia.**—MELBOURNE.—June 4th. State Electricity Commission of Victoria. 22,000-V transformers and spares. (B.X. 5216.)*

June 26th (extended from May 15th). Victorian Railways. One geared three-phase electric winding engine. (A.7650 and A.7853.)*

June 25th. Posts and Telegraphs Department. Telephone cable terminal boxes of the protected type. (B.X. 5231.)*

July 9th. Resistances and reactances. (B.X. 5281.)*

SYDNEY.—June 4th. Public Works Department. 18 electrically-operated water level indicators. (B.X. 5233.)*

July 10th. New South Wales Government Railways. One 750-kW turbo-alternator for Ultimo Power Station. (Specification No. 847, 5s.) 2,200-V ironclad switchgear for Argyle substation. (Specification No. 852, 2s. 6d.) Two switch operating batteries. (Specification No. 850, 2s. 6d.) Two motor-generator sets. (Specification No. 851, 2s. 6d.) Specifications from the Chief Electrical Engineer, 61, Hunter Street, Sydney.

**Ayr.**—District Committee. Installation of electric wiring in the District Fever Hospital, Old Cumnock. Specifications from Mr. J. MacEwan, consulting engineer, 62, Robertson Street, Glasgow.

**Belfast.**—May 21st. Electricity Department. Supply, delivery and erection of h.p. armour-clad switchgear, air preheaters, 22,000-V 3-phase transformers, and cable drum trailer and tractor. (May 3rd.) Supply, delivery and erection of a 22,000-V 3-phase overhead transmission line. (May 10th.)

**Belgium.**—ANTWERP.—June 17th. Municipal Council. 32 electric travelling cranes for the new dock. (Cahier des charges No. 755.) (A.X. 7924.)*

**Chile.**—VALPARAISO.—June 1st. Port Administration. Four three-metric-ton electric travelling cranes.

**Croydon.**—June 3rd. Electricity Department. Supply, delivery, and erection of one 20/25,000-kW turbo-alternator, with auxiliaries, boiler-house extensions with two 100,000-lb. boilers, coal handling plant, &c., engine room extension, switchhouse, bridges, and pump house, and 6,600-V switchgear, transformers, &c. (May 10th.)

**East Ham.**—June 12th. Education Committee. Installation of electric lighting at Salisbury School. Specification 10s., from F. H. Thompson, secretary, Town Hall, East Ham.

**Eccles.**—May 29th. Health Committee. Installation of electric light wiring and fittings in 68 houses, Westwood Park, Morton. Specification and form of tender from borough electrical engineer, Electricity Works, Cawdor Street, Patricroft. (Deposit £1 1s.)

**Edinburgh.**—May 21st. District Board of Control. Electrical work for the two higher grade blocks and mortuary at Gogarburn. Schedules from Mr. S. Kaye, architect, 14, Hill Street, Edinburgh.
May 30th. Electrical installation at George Heriot's School, Edinburgh. Specifications from Mr. John Anderson, superintendent of works, 20, York Place, Edinburgh.

**Epsom.**—May 25th. Electricity Department. Supply, delivery and erection of a l.p. d.c. switchboard. (May 10th.)

**Glasgow.**—May 21st. Education Authority. Installation of electric lighting in Hyndland new secondary school. Specifications from Education Offices (Property Department), 129, Bath Street (one guinea deposit).

**Grimsby.**—May 31st. Electricity Department. Electrically-driven boiler feed pump. (See this issue.)

**Hastings.**—June 3rd. Boiler fuel for period commencing July 1st, 1929. (May 10th.)

**India.**—May 21st. India Stores Department. One 400-kW, 6-phase rotary convertor set and accessories for H.M. Mint, Calcutta. (B.X. 5255.)*

May 27th. 500-kW, 6-phase, rotary convertor, starting panel, &c. (B.X. 5279.)*

South Indian Railway Co., Ltd. Supply of spare parts for train lighting cells and v.i.r. cotton and silk covered copper and galvanised iron wire. (See this issue.)

**Kearsley.**—May 20th. U.D.C. Electric wiring of 80 houses, Tasker's Lane Estate. Specifications from Mr. E. Shaw, surveyor.

**Larne.**—May 22nd. Board of Guardians. Installation of electric light at the District Hospital. Forms of tender from Mr. W. Pleasance, 44, Wellington Place, Belfast.

**London.**—BETHNAL GREEN.—May 22nd. Borough Council. Electric lighting installation at two blocks of tenement dwellings. (May 3rd.)
CENTRAL ELECTRICITY BOARD.—May 25th. Supply, delivery and erection of 33,000-V metal-clad switchgear for South-East England Electricity Scheme, 1927. (May 3rd.)
June 17th. Supply, delivery and erection of 33-kV and lower voltage switchgear for the North-West England and North Wales Electricity Scheme, 1928. (See this issue.)
ST. PANCRAS.—June 6th. Electricity Department. Supply of one 1,000-kW motor convertor. (See this issue.)

**Manchester.**—May 28th. Tramways Committee. Electrical equipments, trucks, and air brakes, for tramcars. Specifications and forms of tender from general manager, Corporation Tramways, 55, Piccadilly, Manchester.

**New Zealand.**—AUCKLAND.—June 3rd. Auckland Electric Power Board. Pilot cable and accessories. (B.X. 5244.)*

WELLINGTON.—June 18th. Posts and Telegraph Department. Telephone cords. (B.V. 5251.)*

July 16th. Telephone bells. (B.X. 5272.)*

August 6th. Public Works Department. One 120-ton four-motor overhead travelling crane and runway. (A.X. 7810.)*

August 13th. Water turbine-driven generating sets and switchgear for Waitaki. (B.X. 5278.)*

**Ogmore and Garw.**—May 31st. Electricity Department. A short length of 11-kV transmission line, and l.p. overhead and underground mains. (May 10th.)

**Renfrewshire.**—May 20th. Education Authority. Electric lighting installation and heating work for new clinic at Barrhead. Schedules (deposit £1) from Executive Officer, County Education Offices, Paisley.

**Richmond.**—May 22nd. Board of Guardians. Re-wiring, &c., for electric light buildings at the Grove Road Institution, Richmond. (Deposit £1.) Particulars from Mr. C. L. Fenn, clerk, Guardians' Offices, Parkshot, Richmond, Surrey.

**South Africa.**—JOHANNESBURG.—June 20th. South African Railways and Harbours. One 10-ton and three 4-ton electric level luffing cranes. (A.X. 7828.)*

**June.** 1st. Town Council. Truck type cubicles. (B.X. 5285.)* Oil switches. (B.V. 5283.)*

PRETORIA.—June 27th. Posts and Telegraphs Department. Automatic wall and table-pattern telephones. B.X. 5273.)*
May 27th. Town Council. Transformers. (B.X. 5258.)*

**Stoke-on-Trent.**—June 22nd. Installation of electric light and power in new buildings proposed to be erected at the North Staffordshire Technical College. (See this issue.)

**Uruguay.**—MONTEVIDEO.—May 22nd. National Administration of the Ports. Four electric cranes (to lift 3 metric tons) mounted on trucks. (A.X. 7814.)*

**Yorks.**—May 31st. West Riding Education Committee. Electric light installation for the Malty Craggs and Aston Schools. Mr. A. Adcock, divisional clerk, "Craigmoor," Godstone Road, Rotherham.

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

# Contracts Closed.

**Colchester.**—City Council. Accepted :—
Pipe work for the electricity works (£2,950).—Brightside Foundry & Engineering Co., Ltd.

**Dewsbury.**—Town Council. Accepted :—
Wiring 37 houses for electric light, at £221.—Beaumont and Blackburn.

**Dumfries.**—Town Council. The contract for a turbo-alternator was referred back to the Electricity Committee for further consideration.
Cooling tower (£1,792).—Premier Cooler & Engineering Co., Ltd. (Accepted.)

**East Ham.**—Electricity Committee. Accepted :—
H.p. and l.p. switchgear and remote control gear (£3,988); feeder panel (£416).—Bertram Thomas.
Cable, 5,750 yards, 6,600 volt (£5,635).—Enfield Cable Works, Ltd.

**Gillingham (Kent).**—Town Council. Accepted :—
Cable and transformers in connection with extensions to Rainham, Wigmore and Hempstead.—Callender's Cable & Construction Co., Ltd.

**London.**—Central Electricity Board.—The Central Electricity Board has placed the following contracts in connection with the South-East, Central, and North-West England and North Wales Electricity Schemes; the value of the contracts is approximately £300,000.
South-East England. Secondary transmission lines.—Watshams, Ltd.
Central England. Secondary transmission lines.—Watshams, Ltd.
North-West England and North Wales. Secondary transmission lines.—Siemens Bros. & Co., Ltd., and John Collier, Ltd. Secondary transformers.—English Electric Co., Ltd.
London County Council.—Highways Committee. Recommended :—
New special tramway trackwork and replacements. Extension of contract for five years on basis of fluctuating percentage.—Hadfields, Ltd.
Electric incandescent lamps.—Siemens Electric Lamps and Supplies, Ltd.
General Post Office.
Telephone switchboard lamps.—Edison Swan Electric Co., Ltd.
Hammersmith.—Electricity Committee.
6-in. sludging pump (£240), 15-in. condensing water pump (£446).—Mather & Platt, Ltd.
Wiring of property. The Council is recommended to enter into contracts with the undermentioned local contractors for the execution of electric wiring installations for a period of six months :—
Brooks & White, A. Bantock & Co., F. E. Beltram, W. T. Canning & Co., E. W. Chamberlen, Fenn & Co., A. H. Fisher, G. Goodchild, J. R. Goode, S. Hellyar, Ltd., L. T. Hall, O. E. Jones, W. T. Lofting, C. J. Mount, M.E.D.A.S., Ltd., A. E. Mayhew & Co., J. B. O'Brien, Smith, Owen & Co., H. E. Steer, Thornton & Co., A. H. Verney, and Wilkins Electrical Works.
Shoreditch.—Lighting Committee.
Electric lighting installation at No. 7 Block, L.C.C. Whitmore Housing Estate (32 tenements).—City Electrical Co. (£485). (Recommended.)
Cable in connection with the mains extension.

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| Hackbridge Cable Co., Ltd. (Recommended.) | £4,525 |
| W. T. Glover & Co., Ltd. ... ... ... ... | 4,610 |
| British Insulated Cables, Ltd. ... ... ... | 4,666 |
| Pirelli-General Cable Works, Ltd. ... ... ... | 4,675 |
| Siemens Bros. & Co., Ltd. ... ... ... ... | 4,725 |
| Union Cable Co., Ltd. ... ... ... ... ... | 4,745 |
| Macintosh Cable Co., Ltd. ... ... ... ... | 4,752 |
| Standard Telephones & Cables, Ltd. ... ... | 4,760 |
| W. T. Henley's Telegraph Works Co., Ltd. ... | 4,797 |
| Greenwich Cable Works, Ltd. ... ... ... ... | 4,829 |

**Plymouth.**—Hospital Committee. Accepted :—
Repairs to storage battery at Mental Hospital (£107).—Tudor Accumulator Co.

**Portsmouth.**—Electricity Committee. Accepted :—
Supply of transmission lines to Emsworth.

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|---|---|
| Johnson & Phillips, Ltd. (Accepted.) ... | £25,268 |
| British Insulated Cables, Ltd. ... ... ... | 25,623 |
| W. T. Henley's Telegraph Works Co., Ltd. ... | 25,908 |
| Callender's Cable & Construction Co., Ltd. ... | 26,373 |
| Siemens Bros. & Co., Ltd. ... ... ... ... | 26,157 |
| Pirelli-General Cable Works, Ltd. ... ... ... | 26,800 |

**South Shields.**—Tramways Committee. Accepted :—
70 tons of tram rails, curves and points (£671).—Messrs. Dorman, Long & Co., Ltd.

**Swansea.**—Electricity Committee.
10,000/12,500-kW turbo set (£34,476).—British Thomson-Houston Co., Ltd. (Six tenders were received, ranging from £34,476 to £36,830.)

# Forthcoming Events.

**North-East Coast Exhibition.**—Newcastle-on-Tyne. May 14th to October.

**World Power Conference.**—Barcelona International Exhibition. May 15th-23rd.

**Association of Mining Electrical Engineers (South Wales Branch).**—Saturday, May 18th. Porthcawl. Annual meeting.

**Faraday Society.**—Thursday, May 23rd. Burlington House, Piccadilly, W. 7.45 p.m. Annual general meeting.

**Physical Society.**—Friday, May 24th. Imperial College of Science, South Kensington, S.W. Ordinary meeting.

# Notes.

## B.S.S. for Distribution Boards.

British Standard Specification No. 214-1929 is a further addition to the series of British Standard Specifications for electrical accessories and installation materials. The specification relates to two-pole distribution fuse-boards and distribution switchboards for ordinary duty with working currents not exceeding 30 A per way, and for use in circuits the voltage of which does not exceed 250 V. The boards are rated in terms of the largest current per way which can be carried continuously without the temperature rise of any of the parts exceeding a specified amount. There are three standard sizes, namely, 5, 15 and 30 A per way. The specification lays down requirements as to design and construction of wood and metal cases, the performance of the switches (if any) and fusible cut-outs, and details of tests to be carried out on completed distribution boards. Copies of the specification can be obtained on application to the Publications Department, British Engineering Standards Association, 28, Victoria Street, S.W.1. Price 2s. 2d. post free.

## Post Office Engineering Appointments.

The Civil Service correspondent of *The Times* states that changes in the mode of filling professional and technical posts in the Engineering Department of the Post Office are to be introduced as the result of an agreement which has been reached on a joint committee of the Post Office Engineering and Stores Department Whitley Council upon the system of recruitment to the supervisory technical grade of inspector, and to the basic professional grade of assistant engineer. In the case of assistant engineers the proportion of vacancies allotted to open competition, limited competition, and promotion which are at present 20, 20, and 60 per cent., respectively, will be varied every two years until 1933-4, when the proportions will be 20, 40, and 40. As regards inspectors, the present proportions of open competition (10 per cent.), limited (10 per cent.), and promotion (80 per cent.) will become 10, 40, and 50 per cent., respectively. The intermediate grades of chief inspector will continue to be recruited solely by promotion.

## The Westinghouse Lighting Institute.

At the end of May there will be opened at the Grand Central Palace, New York, the Westinghouse Lighting Institute, which is described as a permanent institute for the advancement of the art of modern lighting. The Institute will occupy the entire seventh floor of the building, with an area of 40,000 sq. ft. In the Institute there will be a typical city street, with fronting on it a modern home, a bank, a theatre, a petrol-filling station, a florist's shop, and two completely-equipped electrical shops, one typifying the average central power station sales department and the other an ideal example of an electrical shop of average size. In the florist's shop there will be an exhibition of plant growth under electric light. Other exhibits will show examples of office lighting in a typical general office, a directors' office, and a board room. A transport and aviation room will show various methods of lighting steam and electric railway trains and road vehicles. There will also be a model airport, with all kinds of airport equipment, hangar and other buildings, built to scale and properly lighted throughout, with model aeroplanes in actual operation. This room will also contain the model of a railway system with stations, tunnel switches, sidings, and train lighting. Another room will be devoted to demonstrations of various methods of industrial lighting, depicting general, local, and special applications to specific needs, such as bench assembly work, heavy press work, and so on. A 60 ft. by 46 ft. auditorium will have fixtures for demonstrating direct, semi-direct, semi-direct, and totally-indirect lighting, and colour lighting of auditorium walls and ceilings. There will be distribution cabinets on each side of the stage for demonstrating shadow and colour. In the art gallery various effects from light-diffusing lenses will be shown. This room will have facilities for the demonstration of high-intensity illumination upon small areas, such as a hospital operating table.

## Horology.

The programme of the National Association of Goldsmiths' annual conference, which was held at Weston-super-Mare from May 6th to 9th, indicates that the outlook of some electrical engineers is not restricted to their profession. The scientific and archæological aspects of horology were dealt with by members of the Institute. "Britain's Supremacy in Time-keeping" was the subject chosen by Mr. F. Hope-Jones, M.I.E.E., F.R.A.S. The interesting country and antiquities visited were talked about by Mr. R. P. Howgrave-Graham, M.I.E.E, F.S.A., who also accompanied the excursion party to Glastonbury and Wells by motor coach and spoke on the unique archæological features of the district, and also on the Wells Cathedral clock.

## Electrical Detection of Flaws in Rails.

According to the *Times Trade and Engineering Supplement*, the application of electrical methods to the detection and measurement of hidden fissures in rails, both at the mill and after they have been placed in the track, was recently described by Mr. Elmer A. Sperry before the American Iron and Steel Institute. Direct current is employed to provide the intense energisation required to reveal the internal physical condition of the rail. The main primary energising current is made to traverse the rail, or a section of it, by main brushes in contact with the track. Between these brushes are three searching brushes connected to two coils which constitute the primary of a transformer. These coils are wound to produce opposite magnetic excitation of the transformer. All variations in the primary current will be picked up by the two outer brushes, and thus be completely neutralised as to their influence on the secondary of the transformer. But, in passing along the track, when a fissure occurs between one end brush and the middle brush, the first coil will become excited to a greater extent than the other. The transformer will become active, and in the secondary will be induced half, say, the positive side, of a sine-wave curve. In the next instant the fissure passes between the middle brush and the opposite end brush, giving an opposite excitation in the secondary and completing the alternating wave by adding the negative side. The alternating wave so produced passes to the amplifiers and is examined as to both its magnitude and characteristics. In a sound rail the direction of current flow is axial unless disturbed. The slightest disturbance changes this alignment of flow, and means have been found to utilise this deviation, as to both angle and magnitude of the mean axial departure, for giving an accurate interpretation of the cause, especially when all elements are magnified so as to be recognisable. Thus the size, character, and exact position of the fissure or other flaw are accurately determined.

## Neon Light Patents in France.

Mr. Georges Claude is regarded in France as the first to utilise the luminous properties of rare gases, in particular neon, in a practical way. In view of the fact that his patent has been widely utilised, he recently brought an action on his own behalf and on that of the company exploiting his inventions against certain infringers. According to "*l'Industrie Electrique*," after hearing the evidence of experts on both sides, the French Courts have given a verdict in favour of Mr. Claude, who has been awarded damages.

## Electrolytic Production of Sheet Copper.

Works have recently been established at Bex, Switzerland, by the Compagnie des Produits Electro-Chimiques for the electrolytical production of sheet copper. The process employed, which is known as the Jullien-Bex, is akin to the well-known Elmore method, but comprises some innovations which enable scrap red copper and bronze and other low-quality primary material to be used. The copper sheeting is formed on a circular mandril, 13 ft. 9 in. in length and 26¼ in. in diameter, sheets measuring approximately 13 ft. by 6 ft. 6 in. (when trimmed) being produced. The works at Bex have a capacity of about 400 tons per year, the product being largely used for roofing purposes.

## "Relay" Telephones at Cardiff.

The Cardiff City Council has installed automatic telephones throughout its municipal departments in place of the old manually-operated system. At the luncheon on the occasion of the official opening of the p. a. b. x. installation, which was carried out by the Relay Automatic Telephone Co., Ltd., the Lord Mayor of Cardiff (Alderman W. R. Williams, J.P.) said that the system consisted of four switchboards, namely, one at the City Hall, one at the Law Courts, and one each at the Electricity Departments at The Hayes and at Ninian Park Road. By this means all municipal departments were able to communicate with each other automatically in three seconds, and it was a very well-known axiom that "he who saves time saves money." The services of only one operator at each exchange were required, against two with ordinary manual handling. Mr. B. B. Johnson, chief engineer of the Relay Automatic Telephone Co., Ltd., explained that the new installation for Cardiff, although it would considerably benefit internal communication between the Corporation offices and officers, was also part of the public network, and each telephone connected to the Corporation system was capable of being connected to any one of the public network. The Post Office engineers in this country required to satisfy themselves that all apparatus connected to their system must in every way be of the best, in order to meet the exacting requirements of modern telephone service. The exacting nature of the Post Office demands had been a blessing in disguise to British telephone manufacturers because if their products satisfied the Post Office, they would meet the demands of any other administration. For that reason his company should thank the Post Office engineers for their assistance in their early days when his company undertook the vast research work necessary to meet their demands (which cost £250,000), for it was one of the reasons for the success of the "Relay" system abroad, in India and the Colonies, in South America and Japan, and the Czecho-Slovakian Republic. There were now more than 80 exchanges working there, which was a triumph for British engineering, bearing in mind that Czecho-Slovakia was geographically next to Germany, that country of clever and painstaking technicians and cut prices. Cardiff, although the first in Wales, was the fiftieth municipal body in Britain to adopt the "Relay" automatic telephone system, identical with that serving Manchester, Glasgow, Newcastle, Plymouth, and Bristol.

## Junior Institution Dinner.

The annual dinner of the Junior Institution of Engineers at the Monico Restaurant, Piccadilly, on May 10th was well attended by members and their distinguished guests, Mr. W. A. Tookey (vice-president) proving himself as energetic as ever in performing the task of toastmaster. Following the loyal toast, "The Institution" was proposed by Lieut.-Col. K. Edgcumbe (president, I.E.E.), and responded to by Mr. S. H. Hole (chairman, J.I.E.). To the toast of "Pioneers of Progress," proposed by Mr. Frank Hodges, Lieut.-Col. J. T. C. Moore-Brabazon (president, J.I.E.) responded. Mr. S. Dunlop (vice-president, J.I.E.) proposed "Our Guests," on whose behalf Dr. A. E. Dunstan (president, Institution of Petroleum Technologists) and Sir Ernest Moir (president-elect, J.I.E.) responded, while the chairman's health was proposed by Mr. E. D. Gill (vice-chairman, J.I.E.). The Westminster Singers provided the musical programme.

The Institution is now in its 45th year and looks forward to celebrating its jubilee in 1934. The present membership is nearly 1,600, about half of which is in London and the other half divided amongst four local sections, the provinces, and abroad. The Engineers' Register has, particularly since the war, been instrumental in assisting a large number of members to find suitable employment, or improved positions. The personal note is emphasised in the case of members proceeding abroad, who are given introductions by the secretary to members in the locality for which they are bound, so that the bearer can always be sure of a welcome and assistance in becoming acquainted with his new surroundings.

## Home Office Industrial Museum.

The Home Office announces that the Home Office Industrial Museum (97, Horseferry Road, Westminster) will in future be open in the afternoon from 2 to 4 on every week-day (instead of only on Saturday as hitherto), as well as in the morning from 10 to 1.

## Electrical Standards in Australia.

The Australian Commonwealth Engineering Standards Association recently announced that the following Australian standard specifications, which were issued in tentative form for a period of 12 months, are about to be revised prior to their issue as Australian standards:—

C.38-1927.T.—Electrical performance of alternators of the steam turbine-driven type.

C.42-1927.T.—Indicating ammeters, voltmeters, wattmeters, frequency and power-factor meters.

C.46-1927.T.—Liquid starters for electric motors (d.c. and a.c. 3-phase induction, with slip rings).

C.48-1927.T.—Multiple switch starters for electric motors (d.c.).

C.49-1927.T.—Contractor starters for electric motors (d.c. and a.c., 3-phase induction, with slip-rings).

C.53-1928.T.—Fixed condensers for radio reception purposes.

## Humidifying the Vatican Library.

An American firm has constructed an electric steam generator for use in the Vatican Library at Rome. In damp weather the atmosphere in the library becomes so humid that the priceless manuscripts and books show a tendency to decay, which was recently guarded against by the installation of electric heating apparatus. However, during the dry season in Rome the manuscripts become brittle and are in danger of cracking and breaking, and it is the latter contingency that is now to be guarded against by the employment of artificially-produced moisture. The moisture-creating device that is being installed consists of a metal tank filled with water, in which a series of electric heating elements has been immersed. The elements are operated through humidity gauges and thermostats. The apparatus is adjusted for the required humidity, and when the latter drops below the point desired switches are automatically operated, which connects the supply of electricity to the heating elements. These bring the water up to the correct temperature at which it will discharge water vapour into the rooms.

### Institution of Mechanical Engineers.

The Institution of Mechanical Engineers has decided to apply for a Royal Charter. Dr. H. S. Hele-Shaw, who seconded the resolution, said that it would be appropriate if the Charter were granted, as this year was the centenary of their first chairman's invention, namely, George Stevenson's "Rocket."

### The Electrical Association for Women.

The North Wales Branch of the Electrical Association for Women, at the invitation of the Cunard Steamship Company, Ltd., recently visited the *Samaria* in Huskisson Dock, Liverpool. Electricity plays an important part in the equipment of the ship, and the appliances were of special interest to members of the E.A.W.

### Local Societies.

Mr. P. J. Robinson, M.I.E.E., Liverpool city electrical engineer, was re-elected president of the Liverpool and District Electro-Harmonic Society at the annual meeting of the Society held recently. Mr. B. L. Myer (Power Centre Co.) was elected to succeed Mr. L. F. S. Sington, A.M.I.M.E., as hon. treasurer, Mr. E. G. Pulford, jun., was re-elected hon. secretary, and Mr. W. A. Sloane, assistant hon. secretary.

### Appointments Vacant.

Meter tester and repairer for the Bournemouth & Poole Electricity Supply Co., Ltd. Electrical engineer and manager for Felixstowe Urban District Council. Meter mechanic and tester for Harwich Corporation. Storekeeper for Beckenham Urban District Council. Deputy city electrical engineer (£600) for Exeter City Council. Senior switchboard attendant for Darlington Corporation. Assistant lecturer in electrical engineering at Bradford Technical College for the Education Committee. (See our advertisement pages to-day.)

### I.E.E. Students Visit All-Electric Farm.

The prominence given to the all-electric farm of Mr. R. Borlase Matthews since the Electricity Commission granted him powers to supply electricity in an area of 1,280 square miles in Lincolnshire, made the recent visit of sixty members of the Students' Section of the Institution of Electrical Engineers a most popular one. The visitors, many of whom were connected with British electrical manufacturing firms, spent some three hours walking round the estate, and were eager to see the type of machinery required for driving the various farm machines. Those specialising in power supply work were particularly interested in a new and inexpensive type of pole for overhead-line work. Mr. R. Borlase Matthews is using this type of pole on a new overhead line now being erected on the estate. By its use constructional costs of the overhead line are reduced, it is claimed, by at least 70 per cent. Among the other items which claimed the interest of the visitors may be mentioned the hay-curing plant, the electric plough, the electrically-operated binder, and the electro-culture apparatus.

### Overhead Lines Association.

The summer meeting of the Overhead Lines Association will be held in Mid-Cheshire very early in July, by invitation of the directors of the Mid-Cheshire Electricity Supply Co., Ltd., and of the president, Mr. W. Fennell. The local arrangements will be made by the president as time and circumstances may permit, and will be notified to members later. They will include inspection of the new designs of sub-stations for bulk supplies for small towns, suburbs and villages, from the 33-kV main system, and also representative country lines, some on native timber treated on the Cobra process, single-phase, 3,300-volt, with special guarding and compound lines for 3,300 V and 220 V on the same poles. The route will include some of the beauty spots of Mid-Cheshire, and, by way of contrast, the Salt District near Brunner, Mond's works; also an inspection of subsiding areas. The special type of lifting building will be inspected. High tea will be provided at Waverley Cottage, The Brockhurst, Northwich, by invitation of Mrs. Fennell. It is hoped to assemble at Crewe at about midday and to end at 6 p.m. at the same centre, or at a station nearer Northwich if trains permit. It is hoped that this visit, being held in the North Midlands, within easy reach of North Wales, Lancashire, Yorkshire, and the South Midlands, will be attended by members from all parts, especially those who, by reason of distance, cannot attend all the London meetings. Arrangements will be made for cheap fares from centres where eight or more passengers arrange to book in advance and travel together.

A train, with restaurant car, leaves Euston at 8.30 a.m., reaching Crewe at 11.36. A return train at 6.14 p.m. reaches London at 9.5 p.m. Ladies introduced by members will be welcomed, but it will be necessary to make a charge of 8s. each to cover transport expenses. Applications from visitors to attend may be made to the hon. secretary. In order to complete the arrangements and to fix a date to suit the maximum number, it is requested that members will notify the hon. secretary before June 1st, giving him a list of the dates they have free during the first ten days of July.

### The World Engineering Congress in Japan.

As a result of the work of the British Committee on the World Engineering Congress in Japan, which is representative of some 26 engineering institutions and technical societies, 76 papers have been contributed for presentation at the Conference. The following papers are among those contributed by members of the Institution of Civil Engineers: "The Oil-Electric Locomotive in Railway Service," by A. E. L. Chorlton, C.B.E.; "Water Power Developments in Great Britain and Ireland," by W. T. Halcrow, M.Inst.C.E.; "The Water-Tube Boiler Installation at Bankside Power Station, London," by H. E. Yarrow, C.B.E.; "Some Limitations in the Design of Steam Generating Plant for Modern Power Stations," by S. B. Donkin, M.Inst.C.E., and R. W. Mountain, B.Sc. Included in the papers contributed by members of the Institution of Mechanical Engineers are: "Surface Condensing and Feed Heating Plant," by Richard W. Allen, C.B.E.; "Coal- and Ash-Handling Plant in the Modern Boiler House," by Capt. J. D. Troup, M.I.Mech.E.; "Diesel Auxiliary Generating Machinery," by Richard W. Allen, C.B.E.

The following papers will be forthcoming from members of the Institution of Electrical Engineers: "The Administration of Electric Power Supply in Great Britain," by J. M. Kennedy, O.B.E.; "Some Observations Concerning the Determination of the Capacity and Spacing of Sub-stations in High-tension D.C. Electric Railroads," by T. Ferguson, A.M.I.E.E.; "High-tension Underground Cables in Great Britain," by T. N. Riley, D.S.C.; "The Economical Operation of Steam Power Plant—Peak Load Comments," by I. V. Robinson.

### Institute of Transport.

Railway and road problems were discussed at the Institute of Transport Congress at Harrogate on May 9th. Air Vice-Marshal Sir W. Sefton Brancker presided over 250 delegates, and replying to a civic welcome from the Mayor, described transport in this country as more safe, more economical, and more efficient than in any other country. Mr. T. Hornsby, divisional general manager of the North Eastern area of the London and North Eastern Railway, presented an interesting paper on the transport facilities of that railway. Replying to the discussion, he said that the question had been asked whether electrification would solve their problems. He would not like to answer that without careful consideration. Evidence obtained at Newcastle, both with regard to passenger and freight traffic, demonstrated that electrification would help very considerably, but it had to be borne in mind that a large capital expenditure had to be faced, and that there would be a double capital on which to earn revenue. It was a very serious problem.

# Our Personal Column.

**Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.**

At the recent opening of the new Mining Laboratory of the Armstrong College, Newcastle-on-Tyne, by the Prince of Wales, a souvenir miner's lamp was presented to His Royal Highness by Mr. E. Maurice Fisher, eldest son of Mr. H. J. Fisher, M.I.E.E., chief electrical engineer of Lambton and Hetton Collieries, Ltd.

Mr. Samuel T. Davies, who has been appointed secretary of the Stalybridge, Hyde, Mossley, and Dukinfield Electricity Board, was entertained recently by his colleagues at Accrington and was presented with a pewter tea service and gold albert. During his service with the Accrington Corporation, Mr. Davies had charge of the electricity and tramway accounts.

The marriage took place last week at Beetham, of Mr. John Fawcett, of Fawcett & Sons, electrical engineers, Milnthorpe, and Miss L. Burch, of Overthwaite, Beetham.

It was stated at last week's meeting of the Exeter City Council that the development of the electricity undertaking necessitated the appointment of an assistant electrical engineer. The salary, based on the size of the station, would be between £500 and £600 per annum. The Electricity Committee was authorised to advertise the post.

At last week's meeting of the Lowestoft Town Council the Mayor moved the adoption of the report of the Electricity and Transport Committee which contained a recommendation that the salary of the general manager of the electricity and tramway undertakings (Mr. H. H. Saunders) should be increased

from £600 to £700 per annum. His Worship pointed out that Mr. Saunders had converted the tramways from a losing to a paying undertaking. There was opposition to the proposal, which was eventually referred back to the Committee.

The Bury (Lancs.) Electricity Committee recommends that the salary of the borough electrical engineer (Mr. J. G. POTTS) be increased from £850 to £950 per annum.

Councillor H. E. DULCKEN has been elected chairman of the Willesden District Council Electricity Committee.

Mr. E. KILBURN SCOTT is the Liberal candidate for South Leeds.

Mr. E. JACKSON, who for the last 9½ years has been manager of the London office of Messrs. Erskine, Heap & Co., Ltd., has been appointed a director of the company.

Lt.-Commander HAYDN T. HARRISON informs us that his telephone number at 14, Victoria Street, Westminster, has been changed to "Victoria 2943." Commander Harrisen is occupied in research and testing work in the Benjamin Research Laboratory (telephone: Tottenham 3600).

Mr. S. H. CHATTERLEY has resigned his position as manager of Cantie Switches, Ltd., Nottingham, and is shortly taking up duties with Messrs. Dorman & Smith, Ltd.

The Shoeburyness Urban Council has appointed Mr. R. H. HOLMES, of Pembroke, as electrical engineer and manager at a salary of £230 per annum.

Mr. JAMES L. GUNN, at present general manager of the Greenock and Port Glasgow Tramways Co., has been appointed manager of the Aberdeen Corporation Tramways Department, in succession to Mr. William Forbes. The salary is £750 a year, rising by annual increments of £50 to £900. The vacancy was caused by the appointment of Mr. W. Forbes to the managership of the Cardiff tramways. Mr. Gunn started his career in the Leith Corporation Tramways in 1911, and became assistant to the general manager. He was appointed manager of the Greenock and Port Glasgow Tramways Co. three years ago.

**Obituary.**—MR. H. JONES.—The death has taken place suddenly of Mr. Henry Jones, who was in business as an electrical engineer at Colnbrook, Bucks.

MR. J. E. BRADY.—The funeral took place at Walthamstow Cemetery on May 8th of Mr. John Eugene Brady, who was for many years with the Electrical Power Storage Co., Ltd., and its successor, Pritchett & Gold & E.P.S. Co., Ltd. The company was represented at the funeral.

MR. A. TAYLOR.—The death took place on May 5th, after a long illness, of Mr. A. Taylor, who was chief electrician at the Markham Main Colliery, Armthorpe.

MR. R. R. DOUGLAS.—The *Electrical World* reports the death, on April 18th, of Mr. Roydon R. Douglas, who founded the Douglas Electric Construction Co. of New Orleans. Mr. Douglas was a native of Manchester, and went to the United States some forty years ago.

The *Australasian Electrical Times* reports that the death took place on March 5th of Mr. W. CORIN, M.Inst.C.E., M.I.E.E., M.I.E.Aust., who was in charge of electricity supply in Launceston, Tasmania, from its inception in 1895 till 1907. He was then appointed chief electrical engineer to the Department of Public Works, N.S.W. For the past few years he had been engaged in private consulting practice.

**Wills.**—The late Mr. SYDNEY MORSE, J.P., A.I.E.E., left £63,941 gross (£55,533 net personalty).

Dr. LIONEL SELLS, a well-known X-ray worker, left estate of the gross value of £4,259 (£4,185 net).

Mr. ALFRED COOPER, electrical engineer, late of Blackheath, left £14,857 gross (£7,971 net personalty).

The late Mr. T. B. CALLARD, a director of James Keith and Blackman, Ltd., left £25,851 gross and £17,594 net personalty.

# Financial Section.

**New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.**

## New Companies Registered.

**Hydro Thermal Power, Ltd.**—Registered as a public company May 6th. Capital, £50,000 in 2s. shares. Objects:—To acquire patents, licences, secret processes or inventions relating to a system of hydro-electric practice of generating power and a combined boiler and accumulator, to erect hydro-electric power stations and machinery, and to carry on the business of hydro-electric and general engineers and suppliers of electric power; to make experiments in and public exhibitions of electric and hydro-electric lighting and power, to manufacture, put up and use telephones, telegraphs (wireless or otherwise), phonographs, dynamos, accumulators, lamps and apparatus, &c. The subscribers are:—R. H. Wheeler, "Rookwood," Hampstead, N.W.3, insurance broker; F. W. Hallewell, 3, Victoria Street, S.W.1, engineer; V. V. Romanoff, 35, rue Cambon, Paris, metallurgical engineer; Brig.-Gen. E. L. Speare, 8, Little College Street, S.W.1; Granville (?), St. Stephen's House, S.W.1, engineer; H. Stokes Waite, 37, Eaton Place, S.W.1, civil engineer; Sir Geo. C. Buchanan, K.C.I.E., 16, Victoria Street, S.W.1, consulting engineer. The first directors are to be appointed by the subscribers. Solicitors: Cohn, Seligman & Bax, 52, New Broad Street, E.C.2.

**Peerless Productions, Ltd.**—Private company. Registered May 8th. Capital, £1,000 in £1 shares. Objects:—To carry on the business of sellers and purchasing agents for manufacturers of wireless apparatus, motor cars and cycles, gramophones, electrical, scientific and optical instruments, &c. The directors are:—C. G. Fox, Whitedown Cottage, Chobham, Surrey; E. C. Roderick, 53, Bushmead Avenue, Bedford. Registered office: 92, Victoria Street, S.W.

**Mains Radio Gramophones, Ltd.**—Private company. Registered May 4th. Capital, £1,000 in £1 shares. Objects:—To carry on the business of manufacturers of, agents for, and dealers in gramophones and records; wireless and general electrical and mechanical engineers, &c. The directors are:—F. Riddiough, "Lyndhurst," Queen's Drive, Bare, Morecambe; J. W. Riddiough (managing director), West Point, St. John's Park, Menston, Yorks. Registered office: 8, Vaughan Street, Bradford.

**Robinson & Rex, Ltd.**—Private company. Registered May 4th. Capital, £500 in £1 shares. Objects:—To acquire the business of an electrical and gas heating engineer and manufacturer of, and dealer in "Blighty" automatic washers and boilers and other industrial and domestic electric and gas appliances now carried on by H. Robinson at Hampton Wick as "Robinson & Rex." The permanent directors are:—R. J. Mott (chairman), 12, York Buildings, Adelphi, W.C.; H. Robinson, "Rio Vista," Riversdale Road, Thames Ditton. Registered office: Old Castle Wharf, Lower Teddington Road, Hampton Wick, Middlesex.

**Lighting Research, Ltd.**—Private company. Registered May 4th. Capital, £1,000 in 1s. shares. Objects:—To carry on the business of manufacturers of, and dealers in glass of all kinds, lighting engineers and experts, electrical and chemical engineers, &c. The subscribers are:—G. H. Glover, 187, Camberwell New Road, S.E.5, incorporated secretary; F. T. J. Firminger, 1, Probend Mansions, W.4, glass manufacturer. G. H. Glover is the first director. Registered office: 10, Lancaster Place, W.C.2.

**J. Lyons (Electrical & Wireless), Ltd.**—Private company. Registered May 4th. Capital, £200 in £1 shares (100 7 per cent. cumulative preference and 100 ordinary). Objects:—To acquire the business of an electrical engineer and wireless dealer carried on by H. Lyons, trading as "I. Lyons" at Willesden Lane, Willesden Green, N.W. The directors are:—H. Lyons, 8, Streatley Road, N.W.6; I. Karet, 16, Elmcroft Avenue, N.W.11. Secretary: P. L. Courcey. Registered office: Willesden Lane, N.W.2.

**Allom Brothers, Ltd.**—Private company. Registered May 8th. Capital, £3,000 in £1 shares. Objects:—To acquire the business now carried on at 15, George Street, Hanover Square, W., and elsewhere, as "Allom Brothers," and to carry on the business of electricians, mechanical, electrical, motor, wireless, and general engineers and contractors, &c. The subscribers (each with one share) are:—D. V. Turner, "Ketner," Woodfield Road, Hounslow West, secretary; R. M. Stanton, 1, Arundel Street, Strand, W.C.2, clerk. The directors are: G. F. Allom (permanent managing director and chairman)

and others to be appointed by the subscribers. Solicitors: Amery, Parkes & Co., 1, Arundel Street, Strand, W.C.2.

**Wynsor Electric Range Co., Ltd.**—Private company. Registered May 6th. Capital, £1,000 in £1 shares. Objects: To acquire the business carried on by the Windsor Electric Range Co., to adopt an agreement with L. Burn, carrying on business as the Windsor Range Co. and W. D. Stevens, and to carry on the business of manufacturers of and dealers in electrical cookers, radiators, stoves, lamps, flashing signs, electrical and mechanical engineers, &c. The subscribers (each with one share) are:—H. C. Holman, 6, Alexandra Park Road, Muswell Hill, N.10, chartered secretary; H. F. H. Base, 8, Madeley Road, Ealing, W.5, chartered secretary. The first directors are W. D. Stevens and L. Burn. Registered office: 1, Broad Street Place, E.C.2.

**District Supplies, Ltd.**—Private company. Registered May 10th. Capital, £10,000 in £1 shares. Objects: To acquire the business of a dealer in gas and electrical fittings, wireless instruments and accessories, gramophones, &c., carried on by B. Usick, at 43, High Road, Wood Green. The first directors are:—B. Usick, S. Usick, and Mrs. Sarah Usick, all of 32a, Woodberry Down, Finsbury Park, N. Registered office: 43, High Road, Wood Green.

# Official Returns of Electrical Companies.

**Radioservice (London), Ltd.**—Satisfaction to the extent of £125 on April 15th, 1929, of debenture dated July 25th, 1927, securing £2,750.

**Thompson, Ritchie & Co., Ltd.**—Issue on April 29th, 1929, of £500 debentures, part of a series already registered.

**Stone Manufacturing Co., Ltd.**—Debenture dated April 29th, 1929, to secure £1,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Mrs. M. N. Stone, 422, Pinner Road, Harrow.

**Allen West & Co., Ltd.**—Return dated December 31st, 1928. Capital at date of return, £150,000 in £1 shares (increased February 8th, 1929, to £180,000 in £1 shares). 141,724 shares taken up. £141,724 paid. Mortgages and charges, £100,000. Return of allotments made February 21st, 1929, shows a further 27,443 shares allotted as fully paid.

**Asea Electric, Ltd.** (formerly Swedish General Electric, Ltd.).—Capital, £5,000 in £1 shares. Return dated March 8th, 1929. All shares taken up. £5,000 paid. Mortgages and charges, nil.

**Sturge & Baker, Ltd.**—Capital, £8,000 in £1 shares (1,500 preference and 6,500 ordinary). Return dated March 27th, 1929. 1,500 preference and 5,896 ordinary shares taken up. £7,396 considered as paid. Mortgages and charges, nil.

**White & Mantle, Ltd.**—Capital, £1,000 in £1 shares. Return dated December 31st, 1928 (filed April 4th, 1929). 551 shares taken up. £301 paid. £250 considered as paid. Mortgages and charges, nil.

**Britain's Best Crystal, Ltd.**—Capital, £100 in £1 shares. Return dated October 26th (filed December 13th), 1928. All shares taken up. £100 paid. Mortgages and charges, nil.

**Midget Lamp Co. (1924), Ltd.**—Capital, £2,000 in £1 shares. Return dated January 11th, 1929. All shares taken up. £2,000 paid. Mortgages and charges, £500.

**Flather & Co., Ltd.**—Capital, £20,000 in £1 shares. Return dated November 20th, 1928 (filed February 22nd, 1929). 11,044 shares taken up. £9,544 paid. £1,500 considered as paid. Mortgages and charges, nil.

**Melbourne Electric Supply Co., Ltd.**—Capital, £1,750,000 in 150,000 8 per cent. first preference shares of £5 each and £1,000,000 consolidated ordinary stock. Return dated December 26th, 1928. 100,000 preference shares and £800,600 ordinary stock taken up. £1,286,445 paid on 100,000 preference shares and £786,445 ordinary stock. £14,155 considered as paid on £14,155 ordinary stock. Mortgages and charges, £1,864,056.

**George Moritz, Ltd.**—Capital, £10,000 in £1 shares. Return dated December 20th, 1928. 9,081 shares taken up. £9 paid. £9,072 considered as paid. Mortgages and charges, nil.

**Vulco Dry Battery Co., Ltd.**—Capital, £8,000 in 1,500 preference and 6,500 ordinary shares of £1 each. Return dated December 7th, 1928. 1,500 preference and 6,333 ordinary shares taken up. £3,500 paid. £4,333 considered as paid. Mortgages and charges, nil.

**V. Badman, Ltd.**—Issue on April 30th, 1929, of £25 debentures, part of a series already registered.

# City Notes.

## Associated Electrical Industries, Ltd.

The annual general meeting was held on May 7th, Mr. Howard C. Levis presiding. In presenting the report (*vide* ELEC. REV., May 3rd, p. 798), the chairman referred to the steps which had led to the formation of the company and to the merging of the interests of the Metropolitan-Vickers Electrical Co., Ltd., the British Thomson-Houston Co., Ltd., the Edison Swan Electric Co., Ltd., and Ferguson, Pailin, Ltd. He said that, while it would of necessity take time to fully realise the expected economies, the important fundamental steps had been taken. Several plans were considered, and that which was finally adopted involved the use of the company as a holding company. The ordinary shares of the British Thomson-Houston Co. were purchased by exchanging for them ordinary shares of the Metropolitan-Vickers Co., and shares of the other two companies were acquired for cash. To provide the cash necessary to complete this purchase, to pay the expenses incurred in connection therewith, and to provide additional working capital, each existing ordinary shareholder of the Met.-Vick. Company was given the right to subscribe for one new ordinary share for each ordinary share held, at 25s. per share. All of the new ordinary shares and those issued to pay for the B.T.H. shares ranked for dividend from January 1st, 1929. The Met.-Vick Company's name was changed to Associated Electrical Industries, Ltd., and to preserve the goodwill connected with the old name it was intended to change the name of an existing subsidiary company to Metro-Vick Electrical Products, Ltd.; later, however, it was decided to change the name of the subsidiary to the old name, Metropolitan-Vickers Electrical Co., Ltd., and that was its name at present. The owners of the 500,000 deferred shares of 1s. each—each share having a vote—consented to their holdings being converted into 25,000 new ordinary shares of £1 each—the holders sacrificing 475,000 votes. Only the deferred shares and the preference shares enjoyed voting rights, and as it was desirable, the right to vote was extended to ordinary shareholders, both old and new. The number of directors was increased from 11 to 15, and certain of the then existing directors resigned from the board and became members of the board of the Metropolitan-Vickers Electrical Co.; and Sir William Guy Granet, Gen. the Hon. Sir Herbert Lawrence, Messrs. W. C. Lusk, O. H. Smith, V. H. Smith, C. F. Spencer, the Earl of Verulam and himself (the chairman) joined the Associated Electrical Industries board. Sir Philip Nash became the managing director of the company, and chairman of the Metropolitan-Vickers Electrical Co., Ltd., as reconstituted, and he had joined the board of the British Thomson-Houston Co., Ltd. Together the companies employed nearly 30,000 people in England, and also possessed manufacturing facilities in Australia. With the exception of the output of the Australian shops, and of an insignificant number of specialised articles for which the demand in this country had not as yet justified manufacturing here, all the products sold by the group were at present, and would continue to be, entirely manufactured in Great Britain. Having dealt at length with the balance sheet, the chairman said that the situation as regarded competition, both at home and abroad, had become more severe even than a year ago. The large orders placed by the Central Electricity Board had undoubtedly increased the volume of business offering, and the group had had a fair share of these, but that work had had the effect of attracting the efforts of such a large number of competitors that price levels had fallen as a result. It was a matter for regret that the facilities available for the manufacture of electrical apparatus in this country continued to extend at a greater rate than the increasing demand, with the inevitable result of fiercer competition and a lower level of price. These enlarged facilities also resulted in increased competition in the foreign markets, with resulting lower levels of prices there, created in many cases by competition between English firms. This all pointed to the advisability of every effort being made by those in control of the industry in England to secure co-operative arrangements which would tend to produce an adequate return for the investment of money and brains in the industry. The results of the year under review were satisfactory, considering the circumstances, but the profits were not adequate, having in mind the efforts put forth, the quality of the products sold, and the service rendered to their customers. It was essential for the maximum possible turnover to be obtained in order to get any adequate return on the capital invested, and with that end in view the company had established and had continued to extend its activities in every market in the world where conditions gave any promise of obtaining work. It was satisfactory to note that in spite of competition, not only from British firms, but from all the well-known concerns in Europe and America, they had been able in recent years to obtain about half their business from export markets. He had laid stress on existing conditions with a view to emphasising the need for better organisation of the industry as a whole, and the steps already

taken to merge the interests of the companies now within their group could be regarded only as the beginning of what should be done if the electrical industry in England was to develop successfully and be in a position to render adequate service in this country, and, in addition, bring to Great Britain its proper share of world business in competition with other countries. The report covered the work of the Metropolitan-Vickers Electrical Co., Ltd., as it stood before the fusion, and it was satisfactory to note that during the year the intake of business increased approximately 16 per cent. in money value, representing in actual volume of material a still greater increase, while the output constituted a record in the history of the company. As regarded the group as a whole, during the first four months of the current year the volume of business had increased relative to the corresponding period of 1928, and there was indication, from the business offering, that the volume should be well maintained during the year; prices, however, still tended to be on a lower basis. An examination of the increased business this year showed that there had been a substantial increase in the number and volume of orders for the smaller class of apparatus rather than an increase in contracts of considerable magnitude. This increase in the number of smaller orders indicated not only an improvement in the day-to-day demands for electrical apparatus arising from industry generally in this country, but also denoted the growth of the goodwill of the companies forming the group. Sir Philip A. M. Nash seconded the motion, and the report was adopted without discussion.

### British Thomson-Houston Co., Ltd.

This company's report was reviewed in our issue of May 3rd (p. 797). Mr. H. C. Levis (chairman) presided at the annual meeting on May 8th, and in the course of his address mentioned the resignation from the board of Mr. O. H. Smith, who had joined the board of Associated Electrical Industries, Ltd., and the appointment of Sir Philip Nash as a director. He repeated the statements regarding the acquisition of the B.T.H., Edison Swan and Ferguson, Pailin shares by Associated Electrical Industries which he had made at the meeting of the last company on the previous day. Mr. Levis then reviewed the accounts in some detail, and proceeded to say that the company now employed nearly 12,500 people. Their policy had always been to manufacture in this country everything which they sold, with the exception of a very small number of items where the volume of sales was too small to warrant production. It was their intention, and that of the associated companies, to continue that policy. He had referred at last year's meeting to the holding of the company's ordinary shares by the International General Electric Co. Those and the other ordinary shares of the company had been acquired by Associated Electrical Industries, Ltd. They could never speak too highly of the assistance—technical and financial—which had been rendered to the company in the past, and had been so instrumental in helping to build up the great business.

Mr. W. C. Lusk seconded the motion, and the report and accounts were adopted.

### Johnson & Phillips, Ltd.

The annual meeting was held on May 9th, Mr. J. Macgregor (chairman and managing director) presiding. In moving the adoption of the report (*vide* our last issue, p. 842), the chairman referred to the paying-off in full of the Burndept debenture. He said that a great deal of criticism had been levelled against them when they made that loan, but the policy of the board in supporting the Burndept Co. was sound finance. The Burndept Co. had been a good customer in the past, and they hoped that it would continue to be so for many years to come. He was pleased to be able to report that the temporary falling-off in business had passed, and there were now more orders going through than at this time last year. The business done during the first four months of this year exceeded the business done during the corresponding period of 1928 by 20 per cent. The directors considered the results of the year's working disappointing; the scarcity of work and the keen competition for orders was responsible for this. The demand for electrical plant had not yet caught up with the productive capacity of the industry. The low price of copper ruling during 1928 affected the value of the turnover and the ratio of profit. The coal, iron and steel and shipbuilding industries, all large customers for electrical plant, had only of recent months begun to turn the corner, and though large contracts were placed by the Central Electricity Board during 1928, these had not by any means made up to the electrical manufacturing industry as a whole for the falling off in business due to the waiting attitude of its customers which the new developments in the industry had entailed. Their goodwill in 1928 had been fully maintained, as was proved by statistics compiled by their Sales Department from carefully collected data, which demonstrated that their share of the total general business placed had actually grown. The exceptionally large contracts now being placed by the Central Electricity Board were bound to have a beneficial effect on their business in the future, both directly and indirectly, so that the directors looked forward to a substantial expansion of business from now onwards. It was a tribute to the service rendered by their sales and distribution organisation, and to the quality and reputation of their manufactures, that they had held their own in a period of restricted expansion, and consequently aggravated competition. There were many signs that the lull in electrical development which had characterised the last two or three years would shortly be followed by a period of great activity, apart from the effect of the great national supply scheme. The electrification of the rest of our railways in heavy traffic areas was a certainty of the near future. The operating results shown by those already electrified had put that beyond doubt. The extension of the telephone system was a programme to which all political parties were committed; so was the development of our Crown Colonies, in connection with which the company had already secured much valuable business. In the great overseas Dominions and in the Indian Empire they had also been successful in maintaining their share of the available business, although in certain directions not so much electrical material was imported into those countries as in previous years owing to local considerations and difficulties. Their service and distribution organisation in those great countries was extensive and highly efficient, their reputation in all of them stood high, and they felt confident of being able to share in their future prosperity. In particular, he would mention the expansion of their business in South Africa, which had resulted in their forming a subsidiary company there known as Johnson and Phillips (Pty.), Ltd., the whole of the share capital of which belonged to the company. Towards the end of the year they entered into possession of new London offices at Columbia House, Aldwych, more in keeping with the present status of the company and in closer touch with the centre of electrical and engineering affairs. In addition to the improved office accommodation, these premises contained what were probably the finest cable stores in Central London. Their business had already perceptibly felt the benefit of the change, and the directors were confident that it would have the effect of considerably improving their trade. The report and accounts were adopted.

### British Power and Light Corporation (1929), Ltd.

On Monday last this company offered for public subscription 1,600,000 shares of £1 each at par. Its total authorised capital is £2,000,000, and it was registered on May 7th to operate directly, or through subsidiaries, electrical generating and distributing undertakings. Arrangements have been made to acquire a controlling interest in the North Wales Power Co., Ltd., the Electricity Distribution of North Wales and District, Ltd., the East Suffolk Electricity Distribution Co., Ltd., the South Somerset and District Electricity Co., Ltd., the Trent Valley and High Peak Electricity Co., Ltd., the West Hampshire Electricity Co., Ltd., and the Ringwood Electric Supply Co., Ltd. With regard to the North Wales Power Co., Ltd., the Corporation is acquiring at par 1,806,652 of the 2,000,000 issued 10s. shares, and will advance £300,000 to the company for immediate and future capital requirements. The Corporation is purchasing 88,000 ordinary shares (fully paid) and 50,000 preference shares (5s. paid) of the Electricity Distribution of North Wales and District, Ltd., and is to pay up the balance of the preference capital to provide the company with funds for extensions and working capital. With the exception of the Ringwood concern the other companies involved in the matter are distributing undertakings only. The Corporation is acquiring 119,356 £1 shares in the five companies for £144,674, and will advance to them £100,000 for the purpose of extensions and working capital. The net revenue attributable to the Corporation is estimated at £54,704 for 1929, rising to £160,375 by 1932. It is anticipated that dividend payments will be commenced in the early part of 1930. The directors of the Corporation are Messrs. H. A. Vernet (deputy-chairman, Underground Electric Railways Co. of London, Ltd.); chairman; E. de Stein; C. E. Benson, D.S.O. (Robert Benson & Co., Ltd.); G. W. Partridge (managing director, London Electric Supply Corporation, Ltd.); and G. V. Twiss, managing director. The registered office is at 27, Old Broad Street, E.C.2.

*Reuter* (New York) reported on May 9th that, in co-operation with a London syndicate, Clark, Dodge & Co. were to offer for public subscription on Monday last a new issue of shares in sterling of the British Power and Light Corporation, Ltd. The American portion of the issue was to consist of 1,600,000 shares at £1 par value.

### Brush Electrical Engineering Co., Ltd.

The annual meeting was held on May 13th, Mr. E. Garcke (chairman) presiding. In presenting the report and accounts (ELEC. REV., May 10th, p. 840), the chairman said that the electrical industry as a whole had never been on a higher level of activity, or possessed a more favourable outlook or capacity to render service to the community than at present. This activity was not shared by other important and kindred industries, and these general clouds were now threatening to overshadow the electrical industry. The serious problem was the existence of excessive competition out of all proportion to the merits of emulation and efforts to improve the results of enterprise. Having regard to the difficult nature of the general electrical industry, the profits were not adequate in comparison with the large provision which should be made for cost of research, risk of obsolescence of plant, and for fair remuneration of the highly specialised technical services. Where the bad general situation hit the company in particular was that during the past year it had had to sell 25 per cent. more output in order to obtain the same profit. The company had specialised in the relatively small sizes of Ljungström turbines, but latterly the Electricity Commissioners had decided

to discourage the extension of plant at many of the smaller power stations in order to concentrate the generation of electricity at relatively few selected super-stations. Regarding the suitability of the Brush-Ljungström turbine for sizes about 15,000 kW, and even for super-power station use, the company's technical experts considered that it was adaptable to the highest capacity of unit that might be called for. Referring to transformers, the chairman said they were one of the few firms engaged in their manufacture, but now a number of other manufacturers had entered the field, and they were all exposed to cut-throat competition, with the result that this department of manufacture, which was remunerative to a few, had become ruinous to the many. The co-partnership scheme which had now been in operation for about three years, had proved successful. The report and accounts were adopted, and resolutions were passed converting the share capital of the company into stock, and making certain alterations in the articles of association.

### Urban Electric Supply Co., Ltd.

Mr. P. D. Tuckett (chairman) presided at the annual meeting on May 9th, and in presenting the report and accounts (ELEC. REV., May 10th, p. 841) said that they had been able to maintain the dividend on the larger capital caused by the addition last year of 160,000 ordinary shares. The decrease of £4,431 in revenue was more than accounted for by the compulsory purchase of the Walton undertaking. Reductions in charges had been made in practically all their undertakings within a period which affected the results for 1928, but, on the whole, the reductions had not adversely affected the profits. The approval of the local authority to the sale of the Godalming undertaking to the Aldershot, Gas, Water and District Lighting Co. had been withheld, but as the time limit for the sale had not yet expired, some further development in the situation was still possible. The company had issued 44,975 shares in exchange for a like number of shares of the Newquay Company. This company was in the area of the Cornwall Power Co., and the bulk supply to Newquay would be a valuable addition to the business of the Power Co. During the past year the output was materially affected by the closing down of the Tolgus and Tresaran tin mines supplied by the Cornwall Co., the sale of the Walton undertaking, and the abandonment of the tramways at Glossop and Redruth, but there was an increased consumption of 4,282,000 kWh by other consumers. All their undertakings would seriously suffer from the increase in their payment of local rates, due to the heavy increase in their assessments under the recent valuation, and these additional payments, which would exceed £13,000, were likely to seriously curtail their ability to further reduce charges in the near future. Notice had been received of the compulsory purchase of their Stamford undertaking and part of the undertaking of the Twickenham Company. The report and accounts were adopted.

### Marconi's Wireless Telegraph Co., Ltd.

The directors in their report for the year ended December 31st, 1927, state that the profit, after meeting debenture interest, was £412,971, to which was added £25,197 brought forward, making £438,168. Two interim dividends of 10 per cent. were paid, leaving a balance of £23,777 to be carried forward. The 1928 figures are not yet complete, but the directors anticipate that the available profit, after meeting debenture interest and preference dividend, will be about £408,500 plus the amount brought forward. They are paying an interim ordinary dividend of 20 per cent. and an additional 10 per cent. on the 7 per cent. cumulative participating preference shares. Although the distribution will be greater than the profit for the year the directors consider that they are justified in maintaining the dividend, in view of the merger. The report reviews the steps which led up to the merger and re-states the proposed arrangements. After recommending the shareholders to agree to the exchange of their shares for shares in Cables and Wireless, Ltd., the directors state that, in their view, the holders of the £1 shares would be acting in a manner contrary to their own interests by remaining shareholders of the Marconi Company instead of shareholders of Cables and Wireless, Ltd. It is shown that by exchanging their holdings both ordinary and preference shareholders stand to receive a larger return. At the general meeting on May 29th resolutions are to be submitted providing for alterations in the company's articles of association rendered necessary or desirable by the merger scheme. After mentioning the retirement from the board of Sir Frederick Sykes and Mr. P. Ashley Cooper, and the death of Sir John Denison Pender, the directors show how the profits of the company have risen since the reorganisation of the company. The figures, after the deduction of debenture interest, are as follows: 1925, £177,938; 1926, £198,947; 1927, £430,471; and 1928, £426,000.

### Calcutta Electric Supply Corporation, Ltd.

The annual meeting was held on May 8th, Lord Meston (chairman) presiding. In presenting the report and accounts (*vide* ELEC. REV., May 10th, p. 841), the chairman said that the fourth 6,000-kW set in the southern station was put into commission in July last, and one of the old Oerlikon sets at Cossipore was replaced by a 10,000-kW set. The sales of electricity amounted to 148,000,000 kWh, as compared with 129,000,000 kWh in 1927, and as a result of reductions in charges the average price per kWh obtained fell from 1.51 to 1.36 annas. The Calcutta Municipality had accepted a seven-years' contract for the supply of electricity to municipal buildings at 2 annas per kWh, and for street lighting at 1¼ annas per kWh. The "standard rate A" to large power consumers was being reduced by 10 per cent. as from July 1st next. During 1928 the Government of Bengal had granted the company a licence for the supply of electrical energy to Serampore. To serve this new area, as well as the Bully-Utterpara municipalities, for which, also, a licence had been obtained, a ring main had been constructed, and this had commenced to carry electricity on April 20th last. Sir James Donald and Mr. G. C. Gooding had joined the board to fill the vacancies caused by the death of General Mahon and Mr. P. V. Luke. The report and accounts were adopted, and a proposal to increase the share capital from 3,000,000 to 4,000,000 in £1 shares was passed.

### Ever-Ready Co. (Great Britain), Ltd.

The report for the year ended March 31st last records a profit of £210,167, as compared with £187,964 in 1927-28. The addition of £30,022 brought forward makes available £240,189. Of this, £41,130 is placed to reserve, and "donations" absorb £363, leaving £198,696. As we have already reported, the final dividend on the old ordinary shares is 25 per cent., making 35 per cent. for the year as for 1927-28. The new ordinary shares, issued as a bonus, receive 25 per cent. During the year £39,675 was spent on extensions of plant and equipment, while £340,059 was expended on the acquisition of an interest in Lissen, Ltd., and deferred shares in the Ever-Ready Trust and Finance Co., Ltd., and the provision of further capital for the Continental businesses. Reference is made to the issue of bonus shares made in January last, and an issue of 395,200 ordinary shares in February at 20s. 6d. per share. The report also records the death of the chairman, Mr. C. H. C. Moller, and the appointment of Mr. F. S. Johnson to the board. Meeting: May 31st.

### International Telephone and Telegraph Corporation.

At a special meeting on May 8th, it was decided to change the stock of the Corporation from shares each of a par value of $100 to shares without par value and to increase the authorised capital stock of the Corporation from 2,500,000 shares of a par value of $100 to 15,000,000 shares without par value and to change the number of issued shares of capital stock of the Corporation to three times that number. The directors later announced that they had authorised the issue of common stock of the Corporation without par value at an issue price of $50 per share and the offer of that stock to the stockholders in the ratio of one share for each 10 shares of no par value stock, or the equivalent thereof, standing in their respective names on the transfer books of the Corporation on May 24th.

### Shropshire, Worcestershire and Staffordshire Electric Power Co.

Last week an offer to purchase the whole of the company's "A" and "B" ordinary shares at 50s. per share was made by the Greater London and Counties Trust, Ltd., of which Lord Birkenhead is chairman. The balance sheet of the company as at December 31st, 1928, showed that there were in issue 300,000 "A" shares and 755,000 "B" shares of £1 each, a total of £1,055,000. The dividend on the "A" shares was 8 per cent., and that on the "B" shares 7½ per cent.

### Greater London and Counties Trust, Ltd.

Following the announcement of the offer by the Trust to purchase the "A" and "B" shares of the Shropshire, &c., Power Co., reported above, a statement of the Trust's policy was made last week by Lord Birkenhead, the chairman. He said that the directorate of the trust was, and would remain, British. The same was true of the directors of all its subsidiary companies, of its engineers, and its entire personnel. Moreover, the labour and material employed would continue to be British. "It is my purpose, with the concurrence of all concerned, at a suitable moment, to recommend a public issue in which the British investor will be able to subscribe for as many shares as he wishes, with the result that if such subscription as is anticipated is made upon the scale required for that purpose, the full control will in the ordinary course become British."

### Bogota Telephone Co., Ltd.

The directors have informed the shareholders of an offer made by the Cable, Telephone & General Trust, Ltd., to purchase the whole of the issued ordinary capital of the company at 35s. per share. The offer is conditional upon acceptance by the holders of 75 per cent. of the shares on or before May 21st. The directors have accepted the offer so far as their own holdings are concerned, and advise the shareholders to do the same. Under the terms of the offer the directors and certain officials of the company will retire, receiving £12,000 between them as compensation for loss of office. The purchasers are to undertake that all equipment required for use in Bogota, which is not manufactured in Colombia, shall be purchased in England for the next ten years, so far as is practicable, or that an equivalent amount of other business shall be placed in England.

It is reported that a sufficiently large percentage of shareholders have accepted the offer and the purchase is to be proceeded with.

## Stock Exchange Notices.

The undermentioned have been ordered to be officially quoted :—

Associated Electrical Industries.—1,225,000 ordinary shares of £1 each, fully-paid, Nos. 2,185,001 to 3,385,000 and 4,521,951 to 4,546,950.

Brompton and Kensington Electric Supply.—210 ordinary shares of £1 each, fully-paid, Nos. 350,797 to 351,006.

Newcastle-upon-Tyne Electric Supply.—925,000 ordinary shares of £1 each, fully-paid, Nos. 3,082,682 to 4,007,681; and 1,400 5 per cent. preference (non-cumulative and participating) shares of £1 each, fully paid, Nos. 1,537,553 to 1,538,952.

Underground Electric Railways of London.—4,662 ordinary shares of £1 each, fully-paid, Nos. 7,116,651 to 7,121,312.

Application has been made to the Committee to allow the following to be officially quoted :—

Adelaide Electric Supply Co.—£250,000 5½ per cent. redeemable consolidated debenture stock.

Associated Electrical Industries.—1,136,950 ordinary shares of £1 each, fully paid, Nos. 3,385,001 to 4,521,950.

## British Electric Transformer Co., Ltd.

The profit for the past year was £14,740, as compared with £53,703 for 1927. The addition of £10,855 brought forward makes available £25,595. From this, £4,000 (against £5,000) is transferred to depreciation reserve, and six months' dividend is paid on the 7 per cent. preference shares, leaving £11,905 to be carried forward. Last year £10,000 was put to reserve, and a dividend of 5 per cent. was paid on the ordinary shares. The directors state that conditions during the year were very difficult, and there was a great deal of price cutting. The current year has opened with unprecedented activity, for in addition to the ordinary business large orders for transformers have been received from the Central Electricity Board. These orders will provide work for the next two or three years. There were indications of a large electrical development in this country which should react favourably on the company's future. The company has established a lamp factory in extension of its "Sunray" radiator business. To provide working capital negotiations for the sale of some of the properties are in hand. Pending the realisation of this, the directors have decided to defer the payment of the last half-year's preference dividend; this will be considered at a later date during this year. Meeting: May 21st.

## Birmingham District Power and Traction Co., Ltd.

The revenue for the past year amounted to £120,626, and after deducting payments to local authorities and income tax there remains £99,729, to which is added £44,995 brought forward, making £144,724. Interest on debenture stock (£10,817) and renewals (£6,971) are deducted, leaving £126,882. A dividend of 7 per cent. for the year on the ordinary shares is recommended, and the balance carried forward is £45,855. Meeting: May 29th.

## Aeonic Radio, Ltd.

A meeting was held on Tuesday last for the purpose of raising the authorised capital from £225,000 to £450,000 by the creation of 2,250,000 new shares of 2s. each. Of these 1,250,000 will be offered to existing shareholders at par. The proceeds are required to finance the purchase of the Kramolin concern, Berlin, which owns a large number of radio patents, including a "push-button" receiver by means of which any one of 20 stations can be picked up automatically.

## Lewes and District Electric Supply Co., Ltd.

The net receipts for the past year were £11,218, as compared with £11,598 in 1927, and after meeting expenses, interest, and £3,500 for renewals, there is a surplus of £3,658 (against £4,522), to which is added £3,403 brought forward, making £7,062. A dividend on the ordinary shares of 10 per cent., and the placing of £2,000 to reserve are proposed, leaving £2,735 carried forward.

## Swansea Improvements and Tramways Co.

The total revenue for 1928 was £136,546, and after deducting expenses, debenture interest, &c., £9,009 payable to Swansea Corporation, and setting aside £20,000 for renewals, there is a surplus of £11,102, which, with the addition of £6,481 brought forward, makes £17,583. It is proposed to place £2,000 to reserve, and pay a dividend of 6 per cent. for the year, leaving £5,183 to be carried forward.

## British Electric Traction Co., Ltd.

The directors recommend a cash dividend of 5 per cent. on the deferred ordinary stock, together with a bonus of 10 per cent. in fully-paid £1 ordinary shares, in respect of the year ended March 31st last, as for 1927-28. The 6 per cent. cumulative participating preference stock thus becomes entitled to an extra dividend of 1.67 per cent.

## Siemens Bros. & Co., Ltd.

A final dividend of 5 per cent. is recommended, making 7½ per cent. for the year as for the preceding year.

# Stocks and Shares.

MONDAY EVENING.

STOCK EXCHANGE markets present various features of interest, in spite of the circumstances that fight in their courses against the likelihood of activity prevailing on the eve of the General Election, and the Whitsuntide holidays, and on account of the monetary outlook. One of the principal features is the marked attention that is being paid to electric lighting shares. In the cable group, activity has subsided in consequence of the fact that the transfer-books of the companies concerned in the merger are closed. Amongst manufacturing issues, United States operators display decided interest in two or three of the companies whose control it is reported that American interests are desirous of acquiring. On the whole, however, Stock Exchange markets are quiet, and are expected to remain so until the end of the present month. There is, nevertheless, an obvious tendency to assume that the shrinkage in the prices of a good many stocks and shares, due to the uncertainties attaching to the General Election, has been carried far enough, and that, whatever happens, the probabilities point more in favour of improvement than of further declines.

### American Influences.

Shropshire, Worcestershire and Staffordshire shares have come into the limelight in consequence of an offer which is being made of 50s. per share for "A" and "B" alike. Evidently there must have been people with knowledge of the likelihood of such an offer maturing, who had been endeavouring to purchase the shares in advance, for the rise in price during the past month has been considerable. Rumours as to what might happen in connection with the company have been in circulation for some time past. It is expected that the majority of shareholders will accept the offer, and the prices of both shares—"A" and "B"—have moved up to 48s. 9d. Midland Counties, which are supposed to be affected in a similar way by the influences which have been at work in connection with Shropshires, have risen 4s. to 34s. Strong inquiry arose for Metropolitan Electric ordinary; the price is 6s. 3d. up, at 47s. 6d. The market is on the *qui vive* for further developments in connection with the industry, and any rumour which links a company with the possibility of being bought out by, or amalgamated with, some other undertaking receives eager attention. North Metropolitan Electric ordinary rose to 32s. 6d. County of London are 1s. 6d. up, at 35s. 6d. The 7 per cent. debenture is better at 106. Isle of Thanet—said to be an object of desire to one of the London undertakings—have advanced to 40s.

### Provincial and New Issues.

Bournemouth and Poole ordinary at 65s. 9d. are ex dividend, and have regained the 1s. 9 3/5d., less tax, taken off the price last week. Scottish Power hardened to 32s. Egham and Staines has been a feature of strength with a jump to 35s., after the lists had closed for subscription to the new shares at 30s. Underwriters received 1s. 6d. per share commission; "money for jam," one of them called it. The new Lancashire Electric ordinary are better at 9d. premium bid, and Clyde Valley new firmed up to 12s. premium. An issue was made at the week-end of £1,600,000 British Power and Light Corporation. The shares, of £1 each, were offered at par. The company is obtaining a controlling interest in the North Wales Power Company, the Electricity Distribution of North Wales and District, and five other electricity supply companies. The company is expected to be in a position to begin payment of dividends early next year. The issue of Young Accumulator shares was left largely in the hands of the underwriters, and the price started at 1s. discount. Northampton Electrics jumped from 38s. to 47s. before easing off to 46s. Midland Electric Power Distributions hardened to 35s. 9d. bid, and Newcastle-on-Tyne ordinary to 26s. 3d.

### Central Electricity Board.

The Central Electricity Board, in publishing its first report, hints at the possibility of a loan in the fairly near future. The Board has arranged temporary advances with the Bank of England; the sum borrowed up to the end of last year amounted to £339,000. This was to provide for expenses during the initial period before the disbursements of the Board should become sufficient to justify raising a loan. Doubtless the stock, when it appears, will be gilt-edged in character.

### Marconis.

Announcement was made on page 842 of last week's ELECTRICAL REVIEW that Marconi's Wireless Telegraph Company would pay a dividend of 20 per cent. on its ordinary shares, and an additional 10 per cent. on the 7 per cent. participating preference shares (making 17 per cent. on the latter) out of profits made in respect of 1928. This means 2s. on the ordinary Marconi shares of 10s., and 4s. on the company's £1 shares. The directors state in the report that "to have allotted twice as many shares to holders of £1 shares, arising out of conversion of the Marconi debenture, as to the original shareholders, is a proposition that could not in fairness be entertained." The prices of the Marconi shares will be quoted ex dividend on the Tuesday following Whitsun.

## Merger Meetings.

The meetings of shareholders in the Marconi and cable companies will be held on May 29th, for consideration and approval of the necessary changes in the Articles of Association. Proprietors in all the companies will receive, nine days earlier, the documents relating to the offer of exchange of shares. Stock Exchange prices are quiet in the meantime. Marconis remain close to 85s. The £1 shares are 5, and the preference 4¼, all virtually unchanged on the week. Canadian Marconis have dropped 6s. 3d. to 33s. 9d. In the cable group, Western Telegraphs put on 10s. at 28 there being no valid reason why their price should not rank on the same level as Eastern ordinary and Eastern Extensions. The company's 4 per cent. debenture stock dropped 1, to 79½. Globe Telegraph and Trust ordinary have risen to 28½, and the 6 per cent. preference shares, a remarkably well-covered investment, advanced 2s. 6d. to 11⅞. Indo-Europeans at 52½, ex dividend of 37s. 6d., are all but unchanged, allowing for that marking. Oriental Telephones are 1/16 up, at 58s. 9d. American Telephone and Telegraph at 230 are ex rights valued at about 6 points This means a slight fall on the week. International Telephone and Telegraph gained 20 points, at 280, on the announcement that shareholders will receive early in June the rights to subscribe to a new issue of shares.

## Rises in Undergrounds.

Political parties are profuse with promises relating to panaceas for unemployment, and some of these are to be fulfilled, we are told through the medium of the railways. Hence a firmer disposition amongst Home Railway stocks. The Undergrounds shared in an improvement which lifted Districts to 76½, "Mets." to 60, and Underground Electrics to 24s. and 114 for shares and income bonds respectively. There has been no particular accession of fresh business. Prices were marked up on a moderate demand for stock coming into a market where sellers had been, for some time past, decreasing in numbers.

## Stock at 1,000.

British Electric Traction deferred ordinary stock has risen 100 points, and now stands at 1,000. Business is so recorded in the Stock Exchange Official List. The company has declared a dividend, on the stock, of 5 per cent., and a bonus of 10 per cent. in fully-paid deferred ordinary shares of £1 each. The participating preferred stock thereby becomes entitled to an extra 1.67 per cent. dividend over and above its 6 per cent. The B.E.T. controls the Birmingham District Power and Traction Company, which holds the controlling interest in the Shropshire, Worcestershire and Staffordshire Company. The Birmingham District Power and Traction has declared a dividend on its own ordinary shares of 7 per cent., which is the same rate as for the previous year.

## Tramways and Traction.

London United Tramways 4 per cent. debenture stock is changing hands with rather unusual frequency, and the price has been put up a couple of points to 64. At the same time, London and Suburban Traction preference were advanced to 13s., although this appears to be complimentary, in view of a marking at 12s. 1½d. In the foreign group, Brazilian Tractions came back to 55½. The Mexican division remains dullish, with no outstanding feature. Lisbon Electric Tramways attracted business at a guinea. La Plata 6 per cent. preference, just ex their dividend of 1s. 6d., are quoted nominally at 22s. 6d. Para Electric Railway ordinary has been done within the past few days at 4s., and Cape Electric Trams at 9s. 9d.

## Manufacturing Companies' Shares.

Associated Electrical Industries have moved back sharply to 45s. ex dividend. The fall is ascribed to a willingness to take profits on the part of people on both sides of the Atlantic. The preference, on the other hand, rose to 55s. Atlas advanced 2s. 6d. to 28s. General Electrics shed ¼, going back to 2¼. This compares with 4¼, touched earlier this year, during the time when the Americans were buying so fervently. Philips Glow Lamps have had another substantial rise, the Amsterdam Bourse becoming greatly excited over a report that the company's German competitors need no longer be feared. Henley's are a good market, at 6 1/16. British Insulated, with a 3s. rise in one day, are up to 3⅞. Enfields drooped to 4¼. Siemens held their price at 27s. 6d.; the 10 per cent. preference at 32s. have shed a few pence. No change occurred in Telephone Manufacturing at 5s. 9d. A fall of 1/16 reduced Electric Constructions to 18s. 9d.

## Miscellaneous.

Power Corporation of Canada reacted 2½ to 107½. Pennsylvania Water and Power shares drooped to 86½. Hydro-Electrics at 34½ and International Holdings at 8⅛ are a dull market. General Electrics (America) reached a record price of $268 on rumours of the shares being split. Babcock & Wilcox are a few pence lower on the week, at 64s. 6d.; Vickers remain firm at 10s. 10½d. Rubber shares are better, thanks to a trifling recovery in the price of the produce.

# Share List of Electrical Companies.

### HOME ELECTRICITY COMPANIES.

| | Nom. | Approx. Dividend. 1927. | 1928. | Price May 13 1929. | Rise or fall | Yield p.c. |
|---|---|---|---|---|---|---|
| | £ | | | | | |
| Bournemouth and Poole ... ... | 1 | 15 | 15 | 65/9xd | +1/8 | 4 11 4 |
| Brompton Ordinary ... ... ... | 1 | 8½ | 8½ | 26/- | — | 5 7 8 |
| Charing Cross Ordinary ... ... | 1 | 8½ | 8½ | 26/- | — | 5 7 8 |
| do. do. 4½% Pref. ... | 1 | 4½ | 4½ | 17/6 | — | 5 2 10 |
| Chelsea ... ... ... ... ... | 1 | 8⅞ | 8⅞ | 26/- | — | 5 7 8 |
| City of London ... ... ... | 1 | 10 | 10 | 33/3 | — | 4 4 6 |
| do. do. 6% Pref.... ... | 1 | 6 | 6 | 23/- | — | 5 4 4 |
| Clyde Valley ... ... ... ... | 1 | | 8 | 32/6 | — | ... ... |
| County of London ... ... ... | 1 | 7½ | 10 | 53/6 | +1/6 | 3 12 0 |
| do. do. 6% Pref.... ... | 1 | 6 | 6 | 23/- | — | 5 4 4 |
| Edmundson's 7% Pref. ... ... | 1 | 7 | 7 | 25/- | — | 5 12 0 |
| Elec. Supply Corporation ... ... | 1 | 11 | — | 57/3 | +1/- | 3 17 0 |
| Kensington Ordinary ... ... | 1 | 8 | 8 | 26/6 | — | 5 5 8 |
| Lancs. Light and Power ... ... | 1 | 7½ | 7½ | 29/- | — | 5 3 5 |
| London Electric ... ... ... | 1 | 8½ | 9 | 27/6 | +6d. | 5 1 10 |
| Metropolitan ... ... ... ... | 1 | 9 | 9 | 2⅝ | +1/16 | 3 15 9 |
| do. 4½% Pref. ... ... | 1 | 4½ | 4½ | 17/6 | — | 5 2 10 |
| Midland Counties ... ... ... | 1 | 6½ | 6½ | 34/- | +4/- | 3 16 6 |
| Mid. Elec. Power ... ... ... | 1 | 15 | 8 | 35/9 | — | 4 9 6 |
| Newcastle-on-Tyne Ordinary ... | 1 | 6 | 6 | 26/3 | +1/16 | 4 11 5 |
| do. 7% Pref. ... ... | 1 | 7 | 7 | 26/- | — | 5 7 8 |
| Notting Hill 6% Pref. ... ... | 10 | 6 | 6 | 11 | +¼ | 5 9 1 |
| North Met. Elec. 6% Pref. ... ... | 1 | 6 | 6 | 23/- | — | 5 4 4 |
| St. James' and Pall Mall ... ... | 1 | 8 | 8 | 27/6 | — | 5 1 10 |
| Scottish Power ... ... ... | 1 | 8 | 8 | 33/- | +1/6 | 5 0 0 |
| South London ... ... ... ... | 1 | 8½ | 8½ | 26/6xd | — | 5 5 8 |
| Urban Ordinary ... ... ... | 1 | 7 | — | 43/8 | — | ... ... |
| Westminster Ordinary ... ... | 1 | 8½ | 8½ | 26/- | — | 5 7 8 |
| Whitehall Elec. Invst. 7½% Pref. ... | 1 | 7½ | 7½ | 24/- | — | 6 5 0 |
| Yorkshire Elec. ... ... ... | 1 | 8 | 8 | 34/- | — | 4 14 2 |

### HOME RAILS.

| | | | | | | |
|---|---|---|---|---|---|---|
| Central London Ord. Assented ... | Stock | 4 | 4 | 72 | — | 5 11 1 |
| Metropolitan ... ... ... ... | ,, | 3 | 3½ | 60 | +½ | 5 16 8 |
| do. District ... ... | ,, | 4 | 5 | 76½ | +1 | 6 10 9 |
| Underground Electric ... ... | £1 | 5 | 7 | 24/- | +6d. | 5 13 10 |
| do. do. Income ... | Bonds | 6 | 6 | 114 | +1 | 5 5 9 |

### TELEGRAPHS AND TELEPHONES.

| | | | | | | |
|---|---|---|---|---|---|---|
| Anglo-Am. Tel. Pref. ... ... | Stock | 6 | 6 | 103½ | — | 5 17 1 |
| do. Def. ... ... ... | ,, | 1½ | 1½ | 24½ | — | 6 2 5 |
| Automatic Telephone ... ... | 1 | 10 | 12½ | 2⅜ | — | 5 18 0 |
| Eastern Extension ... ... ... | 10 | 10 | 10 | 28 | — | *3 11 5 |
| Eastern Tel. Ord. ... ... ... | Stock | 10 | 10 | 280 | — | *3 11 5 |
| Globe Tel. and T. Ord. ... ... | 10 | 10 | 10 | 28½ | +¼ | *3 10 2 |
| do. do. Pref. ... ... | 10 | 6 | 6 | 11⅞ | +⅛ | 5 5 6 |
| Great Northern Tel. ... ... | 10 | 20 | — | 33 | — | ... ... |
| Indo-European ... ... ... | 25 | 10 | 10 | 52½xd | — | *4 11 9 |
| Marconi ... ... ... ... ... | 10/- | 10 | — | 4¼ | — | ... ... |
| Marconi-Marine ... ... ... | 1 | 12½ | 15 | 8½ | — | 4 12 4 |
| Oriental Telephone Ord. ... ... | 1 | 12 | 12 | 2⅞ | +1/16 | ... ... |
| Western Telegraph ... ... ... | 10 | 10 | 10 | 28 | +½ | 3 11 5 |

### HOME AND FOREIGN TRAMS, &c.

| | | | | | | |
|---|---|---|---|---|---|---|
| Anglo-Arg. Trams First Pref. ... | 5 | 5½ | 5½ | 3⅝ | — | 7 11 8 |
| do. do. 2nd Pref. ... | 5 | 6 | 6 | 3½ | — | 7 18 0 |
| do. do. 5% Deb. ... | Stock | 5 | 5 | 71½ | — | 6 14 3 |
| British Electric Traction Def. Ord. | ,, | 5 | 5 | 1000 | +100 | ... ... |
| do. do. Pref. Ord. | ,, | 8 | 8 | 128 | — | 6 5 0 |
| Brazil Traction ... ... ... | 100 | 7 | 8 | 55½ | —8 | 3 12 0 |
| Brit. Columbia Elec. Rly. Pcs. ... | Stock | 5 | 5 | 95½ | — | 5 1 7 |
| London & Sub. Trac. 5% Pref. ... | 1 | Nil | Nil | 18/- | +6d. | ... ... |
| London United Tram Deb. ... | Stock | 4 | 4 | 64 | +2 | 6 9 1 |
| Mexico Trams, 5% Bonds ... ... | — | 5 | 5 | 71½ | — | 6 19 10 |
| Mexican Light Common ... ... | 100 | Nil | Nil | 77½ | — | ... ... |
| do. 7% Pref. ... ... ... | 100 | 7 | 7 | 74½ | —1 | 9 9 0 |
| do. 1st Bonds ... ... — | | 5 | 5 | 76½ | — | 6 10 9 |
| Yorkshire (West Riding) ... ... | 1 | Nil | Nil | 5/- | — | ... ... |

### MANUFACTURING COMPANIES.

| | | 1926. | 1927. | | | |
|---|---|---|---|---|---|---|
| Assoc. Elec. Ord. ... ... ... | 1 | — | 6 | 45/-xd | —6/- | 2 13 4 |
| Babcock & Wilcox ... ... ... | 1 | 13 | 15 | 64/6 | —6d. | *4 13 0 |
| British Aluminium Ord. ... ... | 1 | 10 | 10 | 50/9 | —6d. | *3 18 9 |
| British Elec. Transformer Pref. ... | 1 | 7 | 7 | 15/- | — | 9 6 8 |
| British Insulated Ord. ... ... | 1 | 15 | 15 | 3⅝ | +1/16 | 4 2 8 |
| Brush Ord. ... ... ... ... | 1 | 10 | 10 | 28/9 | +1/16 | 6 14 2 |
| Callenders ... ... ... ... | 1 | 15 | 15 | 4⅜ | — | 3 9 0 |
| do. 6½% Pref. ... ... | 1 | 6½ | 6½ | 1⅛ | — | 5 4 0 |
| Crompton Parkinson Ord. ... ... | 5/- | — | — | 1 | — | ... ... |
| do. 8% Pref. ... ... | 1 | — | 8 | 25/- | — | 6 8 0 |
| Edison-Swan 1st Pref. ... ... | 1 | 7½ | 7½ | 25/9 | — | 7 1 2 |
| do. 5% Deb. ... ... | Stock | 5 | 5 | 86½ | — | 5 15 7 |
| Electric Construction ... ... | 1 | 7½ | 7½ | 18/9 | —1/16 | 8 0 0 |
| Enfield Cable Ord. ... ... ... | 1 | 20 | 20 | 4¼ | —1/16 | 4 14 1 |
| English Electric ... ... ... | 1 | Nil | Nil | 6/8 | — | ... ... |
| do. do. Pref. ... ... | 1 | 3 | Nil | 8/3 | — | ... ... |
| Gen. Elec. Pref. ... ... ... | 1 | 6½ | 6½ | 23/6 | — | 5 10 8 |
| do. Ord. ... ... ... | 1 | 7½ | 10 | 2⅝ | —⅛ | 3 9 8 |
| Henley... ... ... ... ... | 1 | 25 | 25 | 6 1/16 | +1/16 | 4 1 8 |
| do. 4½% Pref. ... ... ... | 5 | 4½ | 4½ | 4¼ | — | 5 6 0 |
| India-Rubber ... ... ... ... | 1 | Nil | Nil | 13/9 | — | ... ... |
| Johnson & Phillips ... ... ... | 1 | 12½ | 10 | 36/3 | — | 5 10 4 |
| Siemens Ord. ... ... ... ... | 1 | 7½ | 7½ | 1⅜ | — | 5 9 1 |
| Telegraph Construction ... ... | 12 | 10 | 10 | 24½ | — | *4 19 3 |

* Dividends paid free of Income Tax.

# Conditions in Poland.

### A Review of Trade and Industry.

A REPORT upon economic conditions in Poland by Mr. R. E. Kimens, C.M.G., Commercial Secretary at Warsaw, has been published for the Department of Overseas Trade by the Stationery Office (1s. 6d. net). The preface to this report contains some general information regarding Poland, stating, *inter alia*, that the area of the country is 386,273 sq. km. and the population over 30,000,000. The languages used are numerous, but Polish, French and German are usually employed in commerce; English is not used a great deal. The United Kingdom provides over 9 per cent. of the imports which in 1928 totalled £77,830,000.

Mr. Kimens says that during the last six years or so Poland has improved and developed in all branches. In 1928, further progress was shown by industry, mining, agriculture, traffic and trade. The exchange remained stable and the country's finances were satisfactory. Against these favourable factors there has to be placed the large adverse foreign trade balance. It is explained that this was due to the expansion of imports of machinery, plant and raw materials, not to increased imports of articles of direct consumption; and to the failure to increase exports to any large extent. Conditions for doing business were not less favourable than in 1927. Although in some branches United Kingdom exporters experienced greater difficulty in obtaining payment, the losses sustained did not exceed the average business risk, in spite of a larger volume of trade and keener competition with other countries. There are no indications that a deterioration of the situation is likely to take place this year. There has been a tightness of money due to increased industrial activity and expansion of trade incommensurate with the financial resources of the country and this has led to too-extended credit.

### The Electrical Trade.

It is shown that the imports of apparatus, conductors and other electro-technical materials in 1928 were valued at 93,136,000 zloty (about £2,150,000), while exports of the same class had a value of 937,000 zloty (about £22,000). Imports of machines and apparatus (which apparently include electrical machinery) reached a value of 320,040,000 zloty (£7,390,000). The report says that in the general and electrical machinery trade the British share is small owing to higher prices and to the reluctance to grant credits which, in this trade, range between two and five years and are readily accorded by other countries. It is said that the Polish mechanical and electrical engineering and machine building-industries developed further during 1928. The demand for radio apparatus is growing but competition with foreign and local manufactures is difficult.

### Advice to Exporters.

It is considered that United Kingdom firms are not obtaining as much of the increased import trade as they should, the main reasons being strong foreign competition, high prices and reluctance to grant credit, under-estimation of the potentialities of the market and inadequate adaptability to local business methods. Mr. Kimens recommends a careful study of the market in general; the quotation of competitive prices; the selling of goods on a credit basis provided that the security is sufficient; the adaptation of goods to local requirements; the use of Polish in correspondence, or, failing that, French or German; the submission of full details, photographs and drawings with tenders, and the employment of the metric system; the appointment of reliable agents whose activities should be controlled by periodical visits of representatives; the establishment of consignment stocks; full inquiry into the standing of firms with which it is proposed to do business, with the assistance of the commercial diplomatic or consular services; and a careful study of the customs tariff, import regulations and transport conditions.

# French Foreign Electrical Trade.

### A Large Increase in Imports.

THE French imports and exports of electrical machinery, apparatus, and goods during the past two years are shown in the appended tables; the values have been converted at an exchange rate of 124 francs to the £.

| | 1927. £ | 1928. £ | Inc. or dec. £ |
|---|---|---|---|
| *Imports—* | | | |
| Dynamo-electric machines and transformers ... ... ... | 426,185 | 532,878 | +106,693 |
| Wireless sets and apparatus ... | 48,298 | 169,515 | +121,217 |
| Wireless valves ... ... ... | 26,532 | 191,782 | +165,250 |
| Other telegraph and telephone apparatus ... ... ... ... | 606,938 | 1,220,669 | +613,731 |
| Frames of dynamos and motors | 871 | 347 | − 524 |
| Incandescent lamps ... ... | 208,064 | 483,072 | +275,008 |
| Arc lamps and parts ... ... | 1,330 | 1,435 | + 105 |
| Carbons for industrial purposes | 50,532 | 100,589 | + 50,057 |
| Electric wire and cable ... ... | 181,911 | 433,000 | +251,089 |
| Armatures and electrical machinery parts ... ... ... | 166,185 | 181,443 | + 15,258 |
| Magnets other than electro-magnets ... ... ... ... | 7,451 | 9,387 | + 1,936 |
| Accumulators and parts ... ... | 18,855 | 36,363 | + 17,508 |
| Dry batteries and condensers ... | 3,161 | 17,443 | + 14,282 |
| Porcelain and other insulators ... | 12,677 | 26,919 | + 14,242 |
| Totals ... ... | £1,758,990 | £3,404,842 | +1,645,852 |
| *Exports—* | | | |
| Dynamo-electric machines and transformers ... ... ... | 700,790 | 872,790 | +172,000 |
| Wireless sets and apparatus ... | 266,516 | 257,234 | − 9,282 |
| Wireless valves ... ... ... | 36,130 | 34,443 | − 1,687 |
| Other telegraph and telephone apparatus ... ... ... ... | 869,137 | 847,274 | − 21,863 |
| Frames of dynamos and motors | 1,460 | 4,661 | + 3,201 |
| Incandescent lamps ... ... | 164,840 | 169,290 | + 4,450 |
| Arc lamps and parts ... ... | 2,137 | 5,315 | + 3,178 |
| Carbons for industrial purposes | 224,300 | 245,742 | + 21,442 |
| Electric wire and cable ... ... | 253,340 | 376,871 | +123,531 |
| Armatures and electrical machinery parts ... ... ... | 187,887 | 254,185 | + 66,298 |
| Magnets other than electro-magnets ... ... ... ... | 3,371 | 790 | − 2,581 |
| Accumulators and parts ... ... | 168,700 | 149,717 | − 18,983 |
| Dry batteries and condensers ... | 36,484 | 55,096 | + 18,612 |
| Porcelain and other insulators | 117,153 | 115,250 | − 1,903 |
| Totals ... ... | £3,032,245 | £3,388,658 | +356,413 |

It will be seen that, whereas the imports have increased to the extent of £1,645,852, or over 90 per cent., the advance in the case of the exports amounts to only £356,413, or under 12 per cent.

# Electrical Imports of British Malaya.

### A Comparison of Two Years' Figures.

BELOW are given the values during 1927 and 1928 of the imports of electrical and allied material into British Malaya, together with notes of increases or decreases in the trade:—

| | 1927. $ | 1928. $ | Inc. or dec. $ |
|---|---|---|---|
| *Wire and cable, insulated—* | | | |
| Total ... ... | 1,605,000 | 2,187,000 | +582,000 |
| From United Kingdom ... | 1,549,000 | 2,124,000 | +575,000 |
| ,, Japan ... ... ... | 17,100 | 12,800 | − 4,300 |
| ,, United States ... | 13,600 | 1,800 | − 11,800 |
| *Telegraph and telephone instruments and apparatus—* | | | |
| Total ... ... | 658,000 | 686,000 | + 28,000 |
| From United Kingdom ... | 642,000 | 656,000 | + 14,000 |
| ,, United States ... | 1,500 | 5,900 | + 4,400 |
| ,, Continent of Europe | 7,700 | 6,700 | − 1,000 |
| *Electric lamps and parts—* | | | |
| Total ... ... | 50,600 | 106,000 | + 55,400 |
| From United Kingdom ... | 18,200 | 42,000 | + 23,800 |
| ,, Continent of Europe | 29,000 | 57,000 | + 28,000 |
| *Electric lamp bulbs—* | | | |
| Total ... ... | 458,000 | 348,000 | −110,000 |
| From United Kingdom ... | 225,000 | 152,000 | − 73,000 |
| ,, Continent of Europe | 125,000 | 123,000 | − 2,000 |
| ,, United States ... | 43,600 | 36,600 | − 7,000 |
| ,, Japan ... ... ... | 58,000 | 31,600 | − 26,400 |
| *Batteries and accumulators—* | | | |
| Total ... ... | 556,000 | 744,000 | +188,000 |
| From United Kingdom ... | 94,000 | 84,000 | − 10,000 |
| ,, Japan ... ... ... | 11,500 | 3,900 | − 7,600 |
| ,, United States ... | 388,000 | 495,000 | +107,000 |
| *Electric lighting accessories and fittings—* | | | |
| Total ... ... | 240,000 | 292,000 | + 52,000 |
| From United Kingdom ... | 165,000 | 212,000 | + 47,000 |
| ,, Continent of Europe | 21,000 | 42,000 | + 21,000 |
| ,, Japan ... ... ... | 47,500 | 34,000 | − 13,500 |
| ,, United States ... | 3,000 | 1,000 | − 2,000 |

| | 1927. $ | 1928. $ | Inc. or dec. $ |
|---|---|---|---|
| *Electrical goods and apparatus (not machinery) not elsewhere mentioned—* | | | |
| Total ... ... | 1,876,000 | 2,146,000 | +270,000 |
| From United Kingdom ... | 1,147,000 | 1,879,000 | +732,000 |
| ,, Continent of Europe | 158,500 | 92,700 | − 65,800 |
| ,, United States ... | 538,000 | 160,000 | −378,000 |
| *Electric generators—* | | | |
| Total ... ... | 128,000 | 130,000 | + 2,000 |
| From United Kingdom ... | 117,000 | 119,000 | + 2,000 |
| ,, Continent of Europe | 8,100 | 3,700 | − 4,400 |
| ,, United States ... | — | 300 | + 300 |
| *Motors—* | | | |
| Total ... ... | 367,000 | 538,000 | +171,000 |
| From United Kingdom ... | 260,000 | 420,000 | +160,000 |
| ,, Continent of Europe | 53,200 | 90,000 | + 36,800 |
| ,, United States ... | 40,000 | 11,000 | − 29,000 |
| *Ignition magnetos—* | | | |
| Total ... ... | 41,000 | 32,000 | − 9,000 |
| From United Kingdom ... | 5,000 | 3,500 | − 1,500 |
| ,, Continent of Europe | 31,500 | 24,000 | − 7,500 |
| ,, United States ... | 4,000 | 3,500 | − 500 |
| *Other electrical machinery—* | | | |
| Total ... ... | 1,419,000 | 2,403,000 | +984,000 |
| From United Kingdom ... | 974,000 | 2,184,000 | +1,210,000 |
| ,, Continent of Europe | 406,000 | 166,000 | −240,000 |
| ,, United States ... | 27,000 | 41,000 | + 14,000 |

# Electrical Communication.

## Some Aspects of Modern Telephony and Telegraphy.

(*Extracts from a lecture before the* ROYAL SOCIETY OF ARTS.)

THE object of this recent lecture by Mr. G. H. Nash, C.B.E., M.I.E.E., European chief engineer of the International Standard Electric Corporation, was to make known to those who were not yet conversant with modern developments, some of the problems that arise on very long telephone connections, the means adopted for reducing or for overcoming difficulties, and to explain how, by modern methods of telephony and telegraphy, a number of communications can be made simultaneously over a single pair of wires without mutual interference.

The lecture was illustrated with a large diagram that indicated the main links in a long telephone connection between two subscribers over two continents, with an intermediate transoceanic link. An improved form of subscribers' set was shown, which was claimed to be more convenient and more comfortable to use than the familiar pedestal type. A difficulty said to be surmounted, said the lecturer, was the variable distance between mouth and mouthpiece, owing to diversity of size of human heads. Entire freedom of movement of a speaker, or listener, during a conversation by telephone was also a point to be gained by correct design of the set.

Mr. Nash then proceeded to describe and to demonstrate a modern automatic system of telephony, and to distinguish it from a trunk exchange, *i.e.*, from an exchange designed for operating long-distance traffic. The arrangements of the Rugby radio station were briefly explained, the lecturer referring to the fact that, as a supplement to the long-wave transatlantic link, a short-wave circuit was now in operation, *i.e.*, two circuits were available during most hours.

Atttention was directed to certain effects that manifested themselves on long-distance telephone connections, namely :— (*a*) *Attenuation distortion*, sometimes called "frequency distortion," being the variation of the attenuation, or the change of power efficiency, with frequency. (*b*) *Phase distortion*, introduced by the difference in time of travel at different frequencies, the time of travel depending upon the way in which the phase shift of the complete system varied with frequency. (*c*) *Echoes*, caused either by the return of part of the speech energy to the talker after an odd number of reflections, or by subsequent repetitions of the speech arriving at the receiving end after an even number of reflections. A typical arrangement for echo suppression used by the International Standard Electric Corporation on four-wire systems was exhibited. In connection with the transatlantic circuit, a special type of voice-operated switching device was employed which differed from a normal echo suppressor in that it was capable of suppressing an echo having zero delay. It was necessary because of the desirability of operating transmitting and receiving stations on the same wave-lengths, so that the receiving system was capable of amplifying the relatively weak signals received from the distant station and yet rejecting the much stronger signals received from the local transmitting station. For that purpose, to avoid clipping the speech, it was necessary to introduce relay networks to retard the speech while switching operations were in progress. The receiving circuit was normally through, and the transmitting circuit normally blocked. Outgoing speech from the toll board arrived first at the amplifier detector bridged across the upper circuit; it operated one relay which blocked the incoming circuit, and another relay which removed the short circuit from the outgoing path. In that condition incoming speech or noise had no effect on the circuit. With the cessation of outgoing speech, the circuit returned to normal. Incoming speech blocked the outgoing circuit and thus prevented any unbalance currents that passed the terminating set from operating the amplifier detector associated with the outgoing circuit. In every case the delay network was of such a length that the switching processes were complete before the speech arrived at the output of the delay network. (*d*) *Interference*, which might be inductive or introduced by the charging and floating machines associated with the power plant of the amplifier stations. Atmospheric interference was a very special problem in itself.

From a technical aspect, no two points on the earth were so remote from one another that it was impossible to connect them by long-distance telephone. Economic limitations of supply and demand had so far prevented the installation of many very long circuits. That which was recently set up between Stockholm and New York was an example of the possibilities of long-distance communication: It was 22,400 km. long and was made up as follows :—10,400 km. of extra-light-loaded cable, 4,700 km. radio link, 6,850 km. of open-wire line, and 314 km. of submarine cable. It was equipped with 138 four-wire repeaters, 24 carrier repeaters, six cord-circuit repeaters, and eight echo suppressors, including the special voice-operated switching device at London and New York.

Various systems had been designed to enable the maximum use to be made of the zero 30,000-cycle frequency range; they comprised : (1) the composite telegraph system, which was superimposed on the telephone system and occupied the frequency range from 0-80 cycles; (2) the carrier telegraph system, which occupied the frequency range from 3,000 to 10,000 cycles; and (3) the carrier telephone system, which occupied the frequency range from 5,000 to 30,000 cycles.

(1) *The composite system*, on an open-wire telephone circuit, provided two independent earth-return telegraph channels. The speed of transmission over each channel might be up to 25 cycles per second, or approximately 60 words per minute, Morse, and by the use of the ordinary telegraph duplex balance the transmission might be in two directions simultaneously. As the use of telephone ringing current fell within the range of 0 to 80 cycles, it was not permissible over a composited circuit, since it would interfere with the telegraph; therefore it was necessary to insert special composite ringer apparatus on the exchange side of the line repeating coils to translate the outgoing 16-cycle ringing current from the exchange to a higher frequency, frequently 135 or 500 cycles, and transmit it over the line. Similarly, it translated incoming calling signals from the line and transmitted 16-cycle current to the exchange.

(2) *The carrier telegraph system* provided 10 independent telegraph channels in both directions, each channel being capable of transmission at a telegraph speed of 40 cycles per second; the currents were more severely attenuated than in the case of direct-current telegraphy, and carrier repeaters must be provided to compensate for the increased attenuation. They were designed so that their spacing would correspond with the telephone repeater spacing on the line, and it was thus possible to accommodate the telegraph repeaters in buildings already housing telephone repeaters.

(3) *Carrier telephone systems* provided one, three, or more channels over an open-wire line, or short underground, or submarine, cable which might be already in use for the usual purposes, *e.g.*, voice-frequency telephony and composite

telegraphy. From a trunk exchange operator's point of view, there was no difference between carrier and any ordinary trunk circuits, and the subscriber would notice only that the carrier circuit was free from the noise usually heard on open-wire trunk lines. At carrier terminals the speech frequencies received from a subscriber's set were used to modulate the carrier frequency; modulation had the effect of converting the speech frequencies to higher frequencies, which were transmitted along the line, and at the receiving terminal the latter were "demodulated," or detected, back to their true place in the frequency scale. By moving the frequencies resulting from several subscribers' lines to different parts of the frequency scale it was possible to provide several conversation channels on the same pair of wires. Separation between the frequencies resulting from the different conversations was effected by means of electric wave filters, each designed to pass a band of frequencies and to eliminate all others. Although it might be thought that carrier apparatus must be comparatively expensive, in practice it was otherwise. In many cases, particularly for distances greater than 200 miles, it was cheaper to install and maintain carrier systems than to provide and maintain additional pairs of wires to give the same facilities. Indeed, a single-channel system had proved to be the more economical for distances as short as 40 or 50 miles.

# The North-East Coast Exhibition.

## Electrical Features of the General Lay-out and Exhibits.

AT an exhibition in an area such as that on the North-East Coast, where the great shipbuilding and allied industries "swamp" the others, one would not expect to find electrical manufacturing represented to a very great extent. With that in mind, the electrical exhibits at the North-East Coast Exhibition, which was opened at Newcastle-on-Tyne by H.R.H. the Prince of Wales on Tuesday last, may be described as a good show. Some three dozen or so purely electrical manufacturing companies are displaying their goods at the exhibition, while very many firms are using electricity extensively for driving their exhibits, lighting their stands, and so on. The electrical exhibits are to be found in the Palaces of Engineering and Industries, two large pavilions covering a total floor space of 260,000 sq. ft.

**Fig. 1.—Exhibition Grounds Lighting Standard; B.T.H.**

A general feature of the Exhibition is the remarkable scheme of illumination, which reveals, among other things, some of the immense possibilities of coloured lighting. Visitors on passing through the huge entrance pylons find a row of attractive fluted standards along each side of the central roadway. These standards, nearly 100 of which are installed throughout the grounds, are of novel design, each consisting of a decorative steel pillar with a cross-arm from which are suspended two "Alabas" lanterns, while a special spherical ornamental globe, housing a floodlight projector, is mounted at the top, fig. 1. The "Alabas" lanterns provide illumination for the roadway, and the floodlight projector in the spherical globe serves the dual purpose of illuminating the grounds and of providing supplementary floodlighting of the buildings. The double line of standards is broken by a large "Mazdalux" electric fountain, which provides a spectacle somewhat resembling a pyrotechnic display, produced in this instance by means of the vivid and rapidly-changing coloured floodlighting of jets of water thrown into the air to heights continually varying from 15 to 40 feet. This fountain is the one which was displayed at the Ideal Home Exhibition at Olympia this year. The operation is the same except that this time remote control is provided.

Approaching the exhibition pavilions, one of the most ambitious applications of spectacular coloured floodlighting ever achieved in this country immediately becomes the centre of attraction. Remarkable results are obtained by means of floodlight projectors concealed at ground level in the foliage around the buildings. These projectors, 50 of which are employed, are of special design, enabling the entire length of the main buildings, including the massive towers of the Grand Court, to be panelled in bright coloured light. The windows of the towers release beams of ultra-violet light from banks of special mercury-vapour lamps suspended in the centre of each tower. Above these, in the lantern tower, 60-cm. searchlights throw moving beams of light into the clouds. The searchlights were supplied by the London Electric Firm, in conjunction with Messrs. C. A. Parsons & Co., Ltd.

The lighting scheme is the result of close co-operation between the lighting engineers of the British Thomson-Houston Co., Ltd., the consulting engineers, and the architects to the Exhibition authorities. The lighting of the Palaces of Engineering and Industry was carried out by Falconar, Cross and Co., Ltd., to the specification of Messrs. Mountain, Wood and MacLean, consulting engineers. The former installation has 112 300-W "Holophane" reflector fittings and additional lights at the entrances and outbuildings. "Hewittic" tubes are employed in the tower, the face of which is floodlighted. The wiring is carried out with v.i.r. "Nonazo" cable on porcelain insulators, iron-cased distribution boards being used throughout.

Advantage has been taken of the opportunity to display the switchgear and transformer equipment in connection with the electricity supply to the Exhibition. At the main Exhibition sub-station in the Palace of Engineering standard C-type Reyrolle switchgear receives the incoming supply at 6,600 V and controls a Ferranti voltage regulator and a Parsons step-down transformer, in addition to a feeder to another "sub" in the grounds. Standard D-type switchgear of the same make is employed for the 440-V distribution. Arrangements are made for floodlighting the equipment; the h.p. portion is screened by expanded metal.

A feature of the general layout of the Exhibition is a figure of "Industry" in the grounds holding a model of a Parsons turbine in one hand and a model of a ship in the other.

The scheme of the stand of the British Electrical Development Association includes one main doorway at the end nearest the entrance to the Hall of Industries in which the exhibit is situated. The side jambs and head of this doorway are glazed with frosted glass, illuminated from behind. The main part of the interior is used as a lounge, in which kinema films are displayed from time to time. On either side of the room two reproductions of the Association's poster boards are erected, on which posters are exhibited and will be changed as the Exhibition proceeds. Below the poster board is a shelf on which are fixed at intervals boxes bearing illuminated transparencies showing various applications of electricity; when possible these will link up with the visit of any particular Convention to the Exhibition. Provision has been made on each side of the stand for seven panels to display paintings of electrical interest. On one side of the main entrance is a painting of a female figure turning a switch, and from the switch coloured streamers are carried to appropriate panels representing domestic applications of electricity. On the other front panel is a painting of a male figure representing power. From this coloured ribbons also stream from the switch which he holds to corresponding panels, showing the many industrial uses of electrical energy. For the interior lighting of this stand there are four ceiling boxes, each 8 ft. by 3 ft. by 1 ft. deep. On one side of each box are three reflectors, facing and illuminating the poster boards. In the centre of each box is a glass panel, 2 ft. by 8 ft., glazed with opal glass, behind which lamps are fixed. Eight wall brackets are also provided. Colour lighting is used, and the wall brackets and centre glazed ceiling panel are of amber. The floodlights, centre panel lighting and wall brackets are on separate circuits, so that they can be individually controlled.

In view of the fact that the first satisfactory electric lamp was developed by Sir Joseph Swan in the vicinity of Newcastle, it is appropriate that the Electric Lamp Manufacturers' Association should be responsible for the display of a veritable "Hall of Light" at the Exhibition. This stand has been designed to indicate how the lamp of the present day, which has been evolved so rapidly from Swan's first lamp, may be employed to the greatest advantage in every field of lighting service. The building itself presents a distinctly modern elevation and is constructed on the latest architectural lines with a lavish use of built-in lighting features. The stand is divided into three interiors, consisting of two outer rooms and a central entrance "Hall of Light." The hall lighting of the ceiling and upper walls is of particular interest as indicating the decorative possibilities of architectural lighting. This form of lighting is not obtained by any system of pendant units installed after the building is erected.

but takes the form of lighting fittings actually designed with, and built into, the structure. The second interior is devoted to the use of electric lamps in the various fields of service. The room is divided into sections, each of which is equipped or furnished in such a manner that realistic settings are provided for the electric lighting. The very latest designs in industrial lighting and office lighting are shown in two of the sections, while almost every application of the electric lamp as a beautifier of the home is indicated in the other two interiors, which are domestic in character. All the displays are carefully indicated by tasteful luminous signs, and the visitor experiences no difficulty in being guided round the stand by these silent demonstrators, while Lighting Service Bureau specialists are in attendance to give advice on all illumination problems.

Passing into the interior devoted to the lighting service work of the Association, the visitor finds particular interest in the model all-electric house, and also the model factory and shop. These models demonstrate in miniature both correct and incorrect uses of electric lamps. Another display which is particularly interesting is the portable demonstration equipment used by the Lighting Service Bureau in connection with lecture demonstrations on various lighting subjects. Four illuminated display panels recessed into the walls indicate the work of the Lighting Service Bureau and are deserving of special attention, since they indicate the widespread nature of this service work and the high ideals upon which it is organised, the aim of the Association being not only to produce electric lamps of the best quality, but to ensure that the lamps are used in the most effective manner.

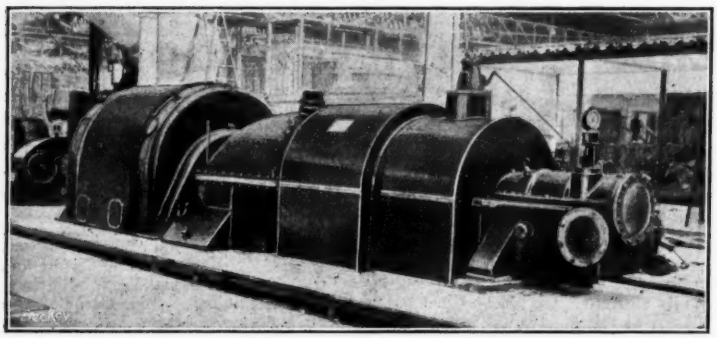


**Fig. 2.—6,250-kW " Parsons " Turbo-alternator.**

Among the exhibitors of heavy-type machinery are Messrs. C. A. Parsons & Co., Ltd., whose main exhibit is a 3,000-r.p.m. reaction turbine, supplied with steam at 165 lb. per sq. in., abs., and coupled to a 6,250-kW alternator, 3 phase, 11,000 V, 50 cycles, and exciter, fig. 2. The closed-circuit system of ventilation is employed for the alternator, a surface air cooler being incorporated in the alternator foundation block. The growth in turbine manufacture and design is shown by a comparison with a small set, 4 kW, 18,000 r.p.m., built 44 years ago and used for lighting the Newcastle Exhibition in 1887.

Another item of interest on the Parsons stand is an outward radial flow turbine which was made in 1891, 100 kW, 4,800 r.p.m., 140 lb. per sq. in. It ran as a condensing turbine and, when officially tested, the consumption per kW-hour was 27 lb., demonstrating the superiority of the steam turbine over the best reciprocating condensing engine at that period. Another feature of this exhibit is a gear case with a wheel and pinion, an example of the Parsons " creep-cut " gearing, which is designed to transmit 670 b.h.p. at 5,000/600 r.p.m. A transformer built in 1890, and in service until a few years ago, is also shown on this stand, and also a section of h.p. and l.p. windings of a present-day 11,000/400-volt transformer. A tapping switch for a 20,000-V, 200-A transformer is another item. Two searchlight reflectors are also shown, one of 90 cm. diameter and the other of 220 cm. diameter. The large reflector is mounted in an angle ring ready for attachment to the back of a projector, and is claimed to be the largest yet made. The weight independent of the mounting is 420 lb.

Messrs. Babcock & Wilcox, Ltd., have arranged a display of their principal manufactures. The Babcock boiler is represented by two scale models, one representing a cross-type marine boiler, and the other a marine boiler as installed in the mercantile service; the latter is fitted for burning oil fuel. The company is also showing a complete model of the equipment for the Babcock process of low-temperature coal distillation, providing for the recovery of tar oils. Low-temperature retorts supply pulverised semi-coke to the furnace of a pulverised-fuel boiler or, alternatively, supply semi-coke in lump form to the chain grate of a stoker-fired boiler. Another exhibit is the firm's patent balanced-lever luffing crane as used for coal unloading.

Messrs. Clarke, Chapman & Co., Ltd., have an interesting display of pulverising equipment. The No. 5 " Resolutor " pulveriser is capable of dealing with 10 tons of coal per hour at a shaft speed of 960 r.p.m. It is driven by a 180-h.p. motor. The No. 0 " Resolutor " pulveriser is capable of dealing with 30-160 lb. of coal per hour, and is driven by a 3-h.p. motor at 2,800 r.p.m. Another item of interest on this stand is an electrically-driven ship's windlass. The 47-h.p., 900-r.p.m., 220-V, d.c. motor is carried on the windlass bedplate and is controlled by the Clarke, Chapman patent booster system. There is also an electrically-driven ship's cargo winch controlled by the same system. Another Clarke, Chapman exhibit is a motor-generator set, consisting of a 70-h.p., 440-V, 3-phase, 40-cycle, squirrel-cage motor driving a standard marine-type 45-kW, 220-V d.c. compound-wound generator. This set is used to supply the necessary direct current for the winch and windlass.

Messrs. J. H. Holmes & Co., Ltd., are showing an electro-plating motor generator, fig. 3, consisting of an a.c. squirrel-cage motor coupled mechanically to a d.c. electro-plating generator with a separate exciter. The whole set is mounted on a combination bedplate, and the output of the dynamo is 550 A at any pressure between 2 V and 10 V. Another Holmes exhibit is a demonstration welding set, consisting of an a.c. squirrel-cage motor coupled mechanically to a d.c. welding dynamo with a separate exciter, the whole equipment being mounted on channel-irons. The output of the dynamo is 25/200 amperes at 18/30 volts. On this stand is also an a.c. totally-enclosed, external-fan-ventilated motor (Electrical Review, April 19th, 1928, p. 694) belted to the first dynamo made by the company in 1885. This dynamo was running in actual service until quite recently, and it was only at the special request of Messrs. Holmes that it was returned to them for retention on account of its historical interest. Other exhibits by this firm include a d.c. motor of the ventilated-enclosed type, with an output of 10-h.p. at 900 r.p.m., a bank of unbreakable grid resistances, and some domestic appliances. Electric traffic signalling is also featured by Messrs. Holmes by means of a working exhibit in conjunction with a representation of a typical suburban road junction.

Internal Combustion, Ltd., are showing a model of the high-pressure boiler plant of Messrs. Synthetic Ammonia and Nitrates, Ltd of Imperial Chemical Industries, Ltd. This consists of eight " Lopulco " boilers, each of 269,000 lb. evaporation at 800 lb. pressure, fired by the Lopulco pulverised-fuel system. The installation is claimed to be the largest high-pressure industrial boiler plant in the world.

A model of the Barking power station of the County of London Electric Supply Co. is another feature of this stand, and a model of the new " R " type burner for the " Lopulco " pulverised-fuel system is also to be seen. This display also includes exhibits of Messrs. Coal Oil Extraction, Ltd., a subsidiary company of International Combustion, Ltd., which designs and constructs low-temperature carbonisation plant.

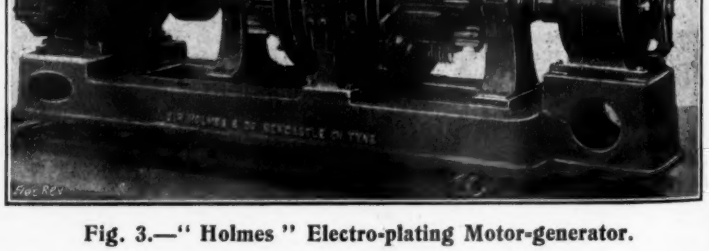


**Fig. 3.—" Holmes " Electro-plating Motor-generator.**

The exhibits of the Underfeed Stoker Co., Ltd., are a typical model of the company's coal-handling plant, a model of its " L " stoker, and also one of its air heaters.

The central feature of the stand of the Yorkshire Copper Works, Ltd., consists of a structure built up of " Yorkshire " aluminium, bronze and cupro-nickel condenser tubes. Interested persons are invited to inspect the internal surface of the various qualities of tubes exhibited by means of the apparatus provided. The company makes a special feature of the investigation and control of corrosion problems. There is also a show case display of tubes illustrating the various types of corrosion attack.

*(To be continued.)*

# Electricity Supply in Tientsin.

## Notes from the Chief Engineer's Report on the Working of the Undertaking in 1928.

WE have received from Mr. A. M. Sillar, M.Inst.C.E., consulting engineer to the British Municipal Council of Tientsin, China, a copy of the report of the chief engineer of the electricity undertaking, Mr. R. A. Williams, O.B.E., on the working of the concern for its sixth year of its operation, 1928.

**Fig. 1.—Electric Lighting in a Tientsin Street.**

The gross and net profits on the year's working were, respectively, £34,717 and £27,927. The net surplus for 1927 was £19,626. The total sale of electricity during the year amounted to 8,023,485 units, as compared with 6,167,312 units in 1927—an increase of 30 per cent., which can be regarded as very satisfactory, especially when the retarding influences of the civil war are considered. The amount of electricity generated during the year was 9,825,314 units, as compared with 7,860,100 units in 1927—an increase of 25 per cent. The capital of the department increased during the year by the amount of £7,688, which was spent on the construction of new transmission lines, &c., and on improvements in the power station. The total capital outlay of £134,136 for 7,500 kW in the power station and the whole of the transmission lines, house services, &c., is £17 17s. 8d. per kW; the cost of the power station alone was £95,769, which is equivalent to £12 15s. 2d. per kW. Both of these figures are considerably lower than those recorded for the average municipal system in Great Britain, and compare favourably with those of any electricity undertaking in the world. Practically the whole of the output of the station was supplied during the past year from the two 2,500-kW Metropolitan-Vickers machines, which have given excellent service in every way. The two original 1,250-kW sets are now only seldom used, as they are small for even light loads. The operation of the larger machines has been very good. The only serious troubles that were experienced during the year were due to the silting up of the Wei Tze Creek, and it is hoped that the dredging that is to be carried out during this year will improve the results of the operation of the station.

The total amount of coal consumed in 1928 was 14,218 tons, or 3.24 lb. per unit. This figure is not as good as that for the previous year, 3.13 lb., which is accounted for by the fact that during the railway troubles in the summer, the undertaking was obliged to use old stocks of coal, and also that, during the winter, the load had risen to such an extent that use was made of the older and less efficient machines and boilers. The total capacity of the boiler house is 86,000 lb. of steam per hour, made up of three boilers each of 12,000 lb., one of 20,000 lb., and one of 30,000 lb. A new boiler of 50,000 lb. capacity has been ordered, and will be erected in time for load in the coming winter.

The whole of the system outside the power station was maintained in excellent condition throughout the year. A considerable amount of work has been carried out to strengthen the mains where required by the increasing load, and at the same time to improve the voltage and lighting in private residences and offices. A number of the terminal overhead high-pressure lines have been taken down and replaced by underground cables, particularly in the neighbourhood of the power station. Nearly the whole of the transmission and distribution is operated on the overhead system by wires carried on substantial concrete poles, the only underground parts being the terminal portions entering into the power or sub-stations. It is noteworthy

**Fig. 2.—General View in Electricity Showroom.**

that there was not a single accidental interruption during the year that could be attributed to the overhead system. The sub-stations and transforming plant are built as simply as possible, so as to require the minimum of attention and losses in transmission; that this has been attained is shown by the fact that the total losses in transmission for the year were 9.4 per cent., a considerable reduction on previous years' figures. The total capacity of the transformers in service on the system was 4,400 kW, serving a connected load of 7,410 kW. The maximum demand of the year on the power station was 3,100 kW, an increase of 8.5 per cent. on the figure for the previous year.

The load factor of the distribution system, based on the actual load supplied outside the station and the electricity sold, was 32.5 per cent. This is a considerable improvement on any previous figure, and is accounted for by the very large increase in the use of electric power during the first half of the year. The corresponding factor for the generating plant was 36 per cent., which again is better than for any previous year.

The total amount of electricity sold in the British municipal area alone during the year was 6,311,108 units, which corresponds to 163 units per head of population. The total number of consumers on the mains at the end of the year was 3,170, the total number of meters installed being 4,202. The total load connected was 7,410 kW, of which 3,215 kW was for private lighting. The average number of units sold per consumer in the British area during the year was 2,010, or 12 per cent. higher than the figure for 1927, indicating the increasing use of electricity for all purposes. The amount of lighting connected to the mains at the end of the year was 3,215 kW. The amount of electricity used for power purposes showed a considerable increase—from 1,612,424 units in 1927 to 2,564,558 in 1928—a gain of 59 per cent.—and there is no doubt that this would have been still higher but for the railway troubles that took place during the second half of the year.

The amount of electricity used for cooking and heating purposes during the year was 548,401 units, which is an increase of 8 per cent. over the preceding year. This increase is comparatively small, and is due to a shortage in the supply of cookers, which has since been remedied.

The street lighting system has been maintained in good condition throughout the year. Fig. 1 gives an idea of the lighting in one of the main streets.

The showroom, fig. 2, has continued to be one of the most useful branches of the Department. No fewer than 1,422 appliances were sold from the showroom during the year, and 464 articles were repaired.

# The Institution of Electrical Engineers.

## The Annual General Meeting and Report of the Council for 1928-9.

THE annual general meeting of corporate members took place on May 9th, the attendance being considerably larger than of late years. After announcing some of the premiums awarded by the Council for papers read during the session, the president, Lt.-Col. K. Edgcumbe, moved the adoption of the Council's report for the year 1928-29, extracts from which follow.

### Annual Report.

During the year the net growth in membership was 518, raising the total to 13,561. During the year 84 members died. The associate membership examination was held in 11 home towns and in 6 countries abroad; a number of candidates submitted written papers or theses in lieu of the examination.

Honours and distinctions were conferred upon 10 members. Action was taken last November in the Court of Chancery against a former student who was describing himself as "A.M.I.E.E." The defendant consented to the granting of a perpetual injunction restraining him from using any designation implying that he is connected with the Institution; he also agreed to pay the costs of the action.

The collection of oil paintings in the lecture theatre has been augmented by gifts by Mr. R. W. Paul and Sir George Sutton, Bt., of paintings of Alessandro Volta and of Sir Charles Wheatstone, respectively.

The Council also accepted offers of further oil portraits from Mr. Ll. B. Atkinson (portrait of Clerk Maxwell), Sir T. Callender (Hopkinson), Mr. E. Garcke (Ampère), Sir Hugo Hirst (Graham Bell), and Sir Charles Parsons, F.R.S. (Swan).

During the past twelve months, 388 meetings were held in London and at the Local Centres by the members, the Council, and the various committees. The attendance and proceedings at the local centres and sub-centres maintained the high standard of the past. As a result of the scheme approved by the Council in 1922 for the formation of local technical libraries in the provinces, there are now such libraries in existence at Dublin, Glasgow, Leeds, Manchester and Newcastle. Sets of technical books to the value of £50 are supplied by the Council to any centre which may wish to have them for lending, or reference, purposes and has proper facilities for accommodating them, and also on condition that each collection is maintained and added to out of the funds of the Local Centre.

The activities of the Wireless Section continued to be satisfactory. Seven meetings, at which six papers were read, and one informal discussion, took place; the average attendance was 118.

The past year marked a further increase in the activities of the Institution in the formation of a Meter and Instrument Section which will be conducted generally on the lines of the Wireless Section, after negotiations with the Meter Engineers' Technical Association, as a result of which the Association was wound up and the bulk of its members joined the Institution.

Eleven informal meetings were held during the session, the average attendance being 69, as against 75 last year.

The large number of lapsed memberships in the class of students was carefully investigated by the Council. There were 3,313 students on the register of the Institution, and the eight Students' Sections carried out a full programme of meetings, visits to works, and social functions. A new feature was introduced in the programmes this session by the delivery of a lecture by Prof. S. Parker Smith, D.Sc., on "Ignition Systems in Automobiles." The lecture, which was given at each of the Sections, was much appreciated, although the attendance at some of the meetings was disappointing. The aggregate attendance amounted to some 400. In response to requests from the Students' Committees, the Council approved of arrangements being made for similar lectures to be delivered annually, to be known as "The Students' Lecture."

The eight Faraday lectures delivered by Mr. Ll. B. Atkinson, his subject being "How Electricity Does Things," were attended by a total audience of approximately 4,800, and the presence of over 4,000 non-members indicated that the lecture achieved the object in view, *viz.*, the bringing of electricity to the attention of the public.

Continuing the series of reviews of progress in electrical engineering which were published in the *Journal* in 1926, 1927 and 1928, reviews on the following subjects have been, or will be, published during 1929:—

"Electrical Standardisation."
"Power Stations and their Equipment."
"Radio-Telegraphy and Radio-Telephony."
"Research."
"Telegraphy and Telephony."
"Transmission and Distribution."

The reviews to be published in 1930 will be on the following subjects:—

"Domestic Applications of Electricity."
"Electrical Equipment of Automobiles."
"Electrical Plant and Machinery."
"Electro-Physics."
"Electric Traction."

The Council awarded three scholarships of £50 and made three grants of £65 each from the War Thanksgiving Education and Research Fund, besides awarding the Coopers Hill War Memorial Prize; the age limit for the I.E.E. award of the latter has been raised to 35 years.

The Jubilee of the first public exhibition of the incandescent lamp (December 18th, 1878) was commemorated by a lecture on the work of the late Sir Joseph Swan, which was given by Mr. James Swinburne, F.R.S., on December 20th, 1928, and by a comprehensive exhibit of early models of lamps.

The Council set up a Committee, consisting largely of members who have had considerable overseas experience, to examine the question of increasing the activities of members in India and the Dominions, and establishing closer links between them and members of the Institution at home.

The Council has drawn up a set of conditions with which, in general, an international technical organisation desiring the official support of the Institution should conform. The status and scope of the various existing international organisations are receiving consideration.

At the annual conversazione the attendance was very large, over 1,700 members and guests being present. At the annual dinner over 600 members and guests were present.

The Gas and Electricity Joint Committee, set up by the National Gas Council and the Council of the Institution in 1926, has drawn up a first report on a section of its terms of reference; publication will be considered later when a more complete report is available.

The number of applicants on the register of the Electrical Appointments Board in March, 1929, was 36, against a total

of 65 last year. The Council earnestly hopes that members who are in a position to assist will not fail to make use of the register.

During the year 270 books and pamphlets were presented to the reference library by members and others, and 103 volumes have been purchased. The total number of readers for the year was 5,985, of whom 285 were non-members, as against 5,400 and 176, respectively, in 1927-1928. Some 86 new volumes were purchased. The total number of readers were issued to 1,006 borrowers, the corresponding numbers for the previous year being 2,287 and 982, respectively.

The physics volume of *Science Abstracts* for 1928 contained 3,355 abstracts, as compared with 3,238 in 1927. The electrical engineering volume contained 2,110 abstracts, as compared with 1,985. The very slight interest taken in *Science Abstracts* by the general body of members is of considerable disappointment to the Council. Out of a membership of over 13,000, less than 900 subscribe to *Science Abstracts*, some 460 members subscribing to both sections and 410 to section "B" only.

Awards of National Certificates and Diplomas in Electrical Engineering in England and Wales were as follows: 361 ordinary certificates; 155 higher certificates (including 6 post-higher certificates); 8 ordinary diplomas; and 6 higher diplomas. The Institution, in conjunction with the Scottish Education Department, has drawn up a scheme for the award of the above certificates and diplomas in Scotland.

Regarding Model General Conditions for Contract, the Council authorised the preparation of a new set of model conditions "E" for the supply and laying of cables at home, and approved of the issue of revised editions of the following sets of conditions:—

A (home—with erection) (April, 1929).
B1 (export—delivery f.o.b.) (December, 1928).
B2 (export, including complete erection or supervision of erection) (December, 1928).

Some modifications to the second edition of the Regulations for the Electrical Equipment of Ships are under consideration. The Regulations for the Electrical Equipment of Buildings continue to be in steady demand, which is an indication that they are being more and more widely adopted; the drafting of a tenth edition is in progress. A pamphlet containing a number of regulations dealing with radio apparatus connected to public or private supply mains was issued in June, 1928, as a supplement to the ninth edition.

In connection with the meeting between the I.E.E. Low-Tension Overhead Lines Conference and representatives of the Post Office, and as the result of representations made by the Electricity Commissioners, the Postmaster-General has intimated that he is prepared, as a final settlement of the question of protection as between electric lines and works of authorised undertakers and those belonging to the Postmaster-General, to bear the whole cost of providing guarding, or alternative protection, when the Post Office is second-comer, provided the following conditions are satisfied:—(1) That the undertakers' legal obligations remain as at present. (2) That the Post Office will only bear the cost of guarding, (*a*) if satisfied that protection is necessary, and (*b*) on condition that where alteration to the power lines is desired, the undertakers will, before carrying out such alteration, meet the Post Office in adopting the most appropriate methods of dealing with the particular circumstances of each case, and will furnish such estimates as will enable the Post Office to determine the course to adopt. (3) That the maintenance of any protective fixtures forming part of their systems remains the responsibility of the undertakers.

The Committee of Management of the Benevolent Fund of the Institution reports that on December 31st, 1928, the total assets of the fund amounted to £15,045, of which £12,068 was on capital account, and £2,977 in respect of unexpended income. The figures include a legacy of £50 from the late Mr. A. R. Bennett. The donations and subscriptions to the fund in 1928 amounted to £1,998, in which amount are included the proceeds of golf competitions organised by the Mersey and North Wales (Liverpool) and Scottish Centres. In 1928, 99 grants were made to 32 persons, amounting to a total of £1,409. Two bequests were made to the fund by will: one of £50 in 1928 from the late Mr. A. R. Bennett (member), and one of £100 in 1929 from the late Dr. C. S. Du Riche Preller (member).

The Institution's annual accounts show that after making provision for contingencies there is a balance to the good on the revenue account for 1928 of £6,040. This amount, which has been carried to the credit of the general fund, compares with £3,675 in 1927. During the year the property in Tothill Street was disposed of on favourable terms, and of the money received (after paying expenses) £9,559 was utilised to pay off the remainder of the mortgage on the Institution building, the balance being invested. The Institution is now clear of any mortgage.

The assets amount to £177,437, which, in comparison with those of the year 1927, show an improvement of £14,675. The investments (including re-investments and conversions) made during the year were £30,058.

## Premium Awards.

The Council made the following awards of premiums for papers read during the 1928-29 session, or accepted for publication:—

The Institution Premium to Messrs. Johnstone Wright and C. W. Marshall, B.Sc.

Ayrton Premium to Mr. L. G. H. Sarsfield, M.Sc.

Fahie Premium to Messrs. A. E. Foster, P. G. Ledger, and A. Rosen, Ph.D.

John Hopkinson Premium to the Hon. Sir C. A. Parsons, O.M., K.C.B., F.R.S., and Mr. J. Rosen.

Kelvin Premium to Messrs. E. B. Wedmore, W. B. Whitney, B.Sc., and C. E. R. Bruce, M.A., B.Sc.

Paris Premium to Mr. J. L. Carr.

Extra Premiums to Capt. J. G. Hines, Mr. B. L. Goodlet, Mr. L. H. L. Badham, Mr. W. Phœnix.

Wireless Premiums to Mr. T. L. Eckersley, B.A., B.Sc., Capt. P. P. Eckersley, and Messrs. A. B. Howe, R. M Wilmotte, B.A., and J. S. McPetrie, B.Sc.

The awards for papers read before Students' Sections will be announced later.

The adoption of the report was seconded by Mr. P. Rosling.

Mr. L. W. PHILLIPS congratulated the Council upon furnishing technical libraries for the local Centres and the appointment of a lecturer to give special students' lectures; he suggested that a feature of such lectures should be the lives of pioneers of the electrical industry. He also suggested that the summer meeting might be held at some other period of the year than June, as that was not always a convenient time for many members to attend. Insufficient publicity had been given to the jubilee of the incandescent lamp by the Council. The Electrical Appointments Board had only 36 names on the list of applicants on March 29th, against 65 last year; was that due to the better state of the industry, or to the fact that the Appointments Board was not very productive in finding jobs for people? Members of other societies were supplied with *Science Abstracts* at lower rates than those charged to members of the Institution, which might be the reason for the small number of copies purchased.

The PRESIDENT said that more appointments had been found last year than in previous years and that accounted for the smaller number of names on the books. The other points mentioned would be considered by the Council. The Institution was not an organisation for publicity and left that matter to the E.D.A. and similar bodies.

Major THEODORE RICH, with regard to the jubilee of the incandescent lamp, said that in a few months' time in America there would be a big "flare up" and he suggested that the Institution should hint that probably Swan had something to do with the invention, because it was evident that the celebration in America would give all the credit to Edison.

The PRESIDENT replied that the Council had been considering that point only that afternoon, and was proposing to take some action in America. In any case, however, he doubted whether the publicity of the Institution would reach the level of the American publicity.

The annual report was then adopted.

Lieut.-Col. CORTEZ LEIGH, in presenting the accounts, which showed a credit balance of £6,040, mentioned that that would be his last year as hon. treasurer and that during his three years of office the assets of the Institution had increased by £22,431. The Council, he added, was considering a proposal to establish a scholarship available at Universities, and also other means of making satisfactory use of the funds available.

Mr. W. C. P. TAPPER congratulated the Council on having at last got rid of the Tothill Street property. A profit of £5,000 had been made, but it would be interesting to know the percentage return on the investment since the property was first acquired. Instead of accumulating assets, it would be wise to spend the money in some useful manner.

The Hon. TREASURER stated that during the first few years of the investment on the Tothill Street property the return was 3 per cent., but in more recent years it had been 4¼ per cent.

Mr. LL. B. ATKINSON reminded the meeting that those figures did not include the £5,000 profit.

The PRESIDENT said the difficulty in recent years had been to make both ends meet and therefore perhaps the Council had been a little ultra conservative. Now, however, that the position had improved steps were being taken to make the best use of the money available.

The accounts were then adopted and votes of thanks were accorded to the hon. local secretaries at home and abroad and to the retiring hon. treasurer. The auditors, Messrs. Allen, Attfield & Co., were re-elected.

## Revision of By-laws.

After lengthy consideration by the Council and the Membership, Examinations, and General Purposes Committees, as well as by the Committees of the Local Centres, the Council sent a circular to members briefly outlining various alterations to the by-laws, the most important of which relate to the qualifications for membership. The alterations were considered at a special general meeting of corporate members held immediately after the conclusion of the annual general meeting.

The PRESIDENT, in explaining the scheme, drew attention to the formation of a new class, known as "Companions," and outlined other alterations to be made as regarded graduates and students. There had been more discussion over the word "Companions" than over any other matter, but even those who objected to it had eventually to acknowledge that they could not provide a better one. There was a precedent for it because the Institution of Mechanical Engineers had a Companion class, and the intention was that in that class should be men who were not necessarily electrical engineers, but

who were eminent in their particular spheres. Under the by-laws, as proposed to be modified, ex-enemy members would no longer be under the disability that they could not join the Institution until a special meeting had been called by the Council; the matter could be dealt with by the Council.

Mr. PHILLIPS expressed dissatisfaction at the manner in which the Council had dealt with this matter. Faraday was an Englishman, Volta was an Italian, Ampere was a Frenchman, and Ohm was a German, all of which indicated our international indebtedness. He moved the deletion of the final words in the proposed bye-law, namely, "and for such further period thereafter as the Council may determine." In other words, he wished that ex-enemy members should automatically become members again at the close of hostilities.

Sir THOMAS PURVES, chairman of the Committee which has dealt with this matter, whilst expressing sympathy with Mr. Phillips' views, did not think the amendment would be of any value, because a member who had ceased to be a member would have to apply for readmission in any case. He could not automatically go back on to the membership roll.

Mr. PHILLIPS said he desired that such ex-members should be able to apply for membership immediately on cessation of hostilities, and that the Council should not have the power to prevent them doing so, as would be the case under the proposed new bye-law.

Mr. F. GILL suggested that such members would be in a better position under the proposed new bye-law, because if they were to apply for membership immediately after the cessation of hostilities such feeling might still exist that he would be rejected, whereas if it were left to the discretion of the Council to feel the pulse of the Institution it would be able to judge the best time for inviting ex-enemy members to rejoin.

Mr. PHILLIPS' amendment was then put to the meeting and lost by a large majority, only three voting for it.

Mr. A. C. SPARKS referred to the difficulty of engineer officers in the Army, Navy, and Air Force obtaining admission to the Institution through not being able to obtain the necessary support from people who must, under the bye-laws, personally know their qualifications. The difficulty arose through so many officers being stationed abroad, who were therefore unable to obtain the necessary signatures. Mr. Sparks also referred to the period of office of members of Council, and suggested that it should not be possible for a member to serve for as long as eight years out of 10; it would be more to the advantage of the Institution to reduce the period in order to spread service on the Council over a wider field. A maximum of five years, he suggested, was ample.

Sir THOMAS PURVES said the difficulty of Service members getting the necessary signatures had been modified and he hoped publicity would be given to the fact that qualified people placed in such a difficulty could obtain membership on the recommendation of persons who had interviewed them and formed a judgment.

The PRESIDENT, referring to membership of Council, suggested that there were difficulties in the way of making an alteration which would reduce the period to five years. On the advice of the solicitor, it was not a matter which could be gone into in detail at that meeting, but he promised that the Council would carefully consider what Mr. Sparks had said. Incidentally, the Institution of Electrical Engineers was the most democratic of all engineering institutions in that respect.

Mr. E. H. O'SHAUGHNESSY suggested that the point mentioned by Mr. Sparks could be handled quite well by the members themselves, because when they learned that a man had been nominated for a second term of office on the Council they could make other nominations themselves.

The resolutions regarding the alterations in the by-laws were unanimously adopted.

# New Electrical Devices, Fittings, and Plant.

**Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.**

## A Portable Electric Blower.

A recent useful introduction by Metro-Vick Supplies, Ltd., Trafford Park, Manchester, is the "Cadillac" blower, fig. 1, an electrically-operated device which can be used for such varied requirements as cleaning printer's type and type-cases, and for spraying disinfectants or insecticides; indeed, for both these purposes there are special attachments, in addition to brushes and nozzles of various shapes and sizes for detail and showcase work. Its applications are innumerable, and it can be instantly converted to a suction cleaner, if required. It is made in three types: model F will give a suction of 22 in. of water with a flow of 65 cu. ft. per min.; model G is a 50 per cent. more powerful edition of model F; and model L will blow cold or hot air as required. All models are arranged with ball bearings, are very strongly made, and weigh only 7 to 9 lb. each. The blowers are fitted with specially constructed universal motors for voltages up to 250 V, with loadings of 205 W in the case of models F and L, and 300 W in the case of model G.

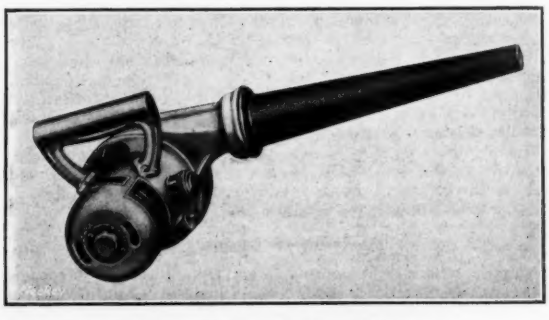


**Fig. 1.—The Cadillac Blower.**

## New Gate-End Circuit Breaker.

The accompanying illustration, fig. 2, shows an a.c. automatic gate-end circuit breaker, recently introduced by Messrs. MAVOR & COULSON, LTD., 47, Broad Street, Mile End, Glasgow, which is claimed to be of novel construction to meet special conditions. The breaker has a capacity of 100 A and is suitable for medium-pressure systems. It is of the automatic oil-immersed type and flameproof in construction, having wide machined joints to the oil chamber. The breaker unit is arranged to be lifted out of the tank, so that the working height is much less than would be the case if space had to be allowed for tank lowering. Accessibility is, however, it is claimed, not sacrificed, as by the provision of suitable disconnectors, the breaker unit can be lifted out of and supported on the tank for inspection and adjustment in a most convenient position and without the collection of dirt. Moreover, the provision of disconnectors avoids the disturbance in any way of the permanent armoured cable or plug connections. Fig. 2 shows the apparatus with the breaker unit withdrawn and supported on the tank for inspection. The breaker units are interchangeable, so that spares of these can be stocked, instead of complete equipments. Further, a breaker unit of lower rating can be substituted for a larger one if required. The gate end circuit breaker can be supplied with two or three overload trips, and a no-volt trip can also be fitted if required. Leakage protection can be provided by the incorporation of a core-balance transformer with a suitable trip.

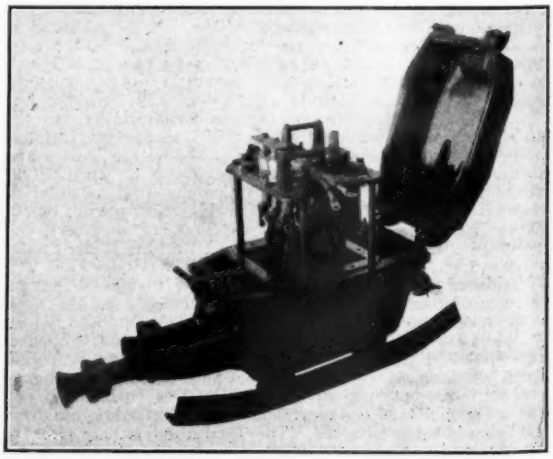


**Fig. 2.—A.C. Automatic Gate-End Circuit Breaker; Breaker Unit Withdrawn.**

### Commutator Slotting Files.

The MARTINDALE ELECTRIC CO., LTD., The Hyde, Hendon, N.W.9, has recently introduced to the home market special commutator slotting files, fig. 3, which are made in two sizes. The standard size has an angle of 60 deg. between the cutting edges, and the other 40 deg. for thin mica. The files are

Fig. 3.—Commutator File.

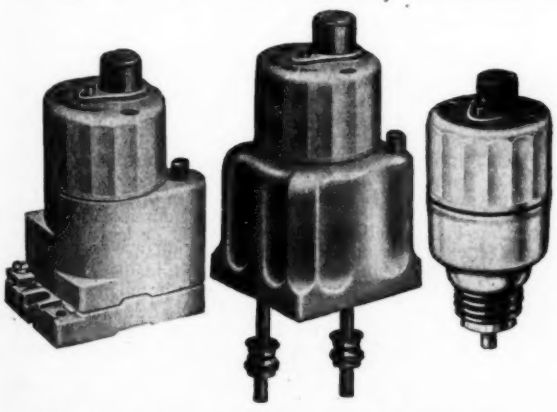
claimed to do their work rapidly, to be easy to operate, to leave a "V"-shaped slot, and to be in every way a great improvement on the old method of using broken hack-saw blades. They are fitted with wooden handles.

### An Adjustable Adaptor Plug.

We have received from Messrs. H. E. ASHDOWN (BIRMINGHAM), LTD., Aldridge Road, Birmingham, a sample of their recent development, a bakelite adjustable adaptor plug. The pins (two) are adjustable by revolving a knurled ring and cap over the body of the plug, through slots in which the pins project, thus preventing any risk of touch contact, such as sometimes occurs when the pins themselves have to be held by the fingers for adjusting to position with the socket holes. Spare pins can be provided for 5-, 10- and 15-A loadings.

### A Novel Automatic Cut-out.

The "Elfa" automatic circuit breaker, which is marketed in this country by the A.E.G. ELECTRIC CO., LTD., 131, Victoria Street, S.W.1, offers, it is claimed, great advantages over cartridge and wire fuses, being constructed to withstand momentary peak loads, while at the same time giving full protection against sustained overloads or short-circuits. When the circuit is opened it is only necessary to press the push button which, on being released, closes the circuit. It is impossible to "play" on the contacts once the push button is released, on account of a locking pawl which, on lowering the contacts into position, prevents the push button being pressed in. There are two independently-acting devices for effecting the release, namely, a magnetic release and a thermal release. The current flowing in the magnetic coil develops a magnetic flux which flows through the divided iron core. The lower part of the core is movable and is attracted by the upper fixed part, towards which it is drawn if the magnetic pulling force exerted by the current flowing in the coils is greater than the pull of the adjustable spring which keeps the lower movable magnet in position. The thermal release consists of two bow-shaped bi-metal strips (a nickel-steel alloy) hot-rolled together. The consequential change of shape of the bow which arises on sufficient current flowing trips the switch. The cut-outs are made in three types, namely, screw, switchboard, and built-in types. The screw pattern can be used in Zed fuse bases, in place of the cartridges. The other two types are each fitted with an extra push-button release, enabling the circuit to be opened without trouble when necessary. Where a number of "Elfa's" are mounted to-



Figs. 4, 5 and 6.—"Elfa" Circuit Breakers.

gether the coloured button fitted below the push button indicates which circuit has blown, *i.e.*, when protruding above the surface the cutout is off, when flush the circuit is closed. The circuit breakers can be used for circuits up to a maximum of 415 V, a.c., and in the case of the screw pattern also on d.c. circuits up to 250 V. In all models there are 15 sizes, with capacities ranging up to 15 A. On 50 per cent. overload the circuit breaker will open within 15 min.; on higher loads the time is considerably shortened; and on five times the normal load the time taken is approximately four seconds. Figs. 4, 5 and 6 show, respectively, the built-in, switchboard and screw patterns of the "Elfa" cutout.

# Parliamentary News.

[By Our Special Parliamentary Reporter.]

### The Dissolution.

Parliament was dissolved on Friday, May 10th. The general election takes place on May 30th, and the new Parliament will assemble on June 25th.

### Special Orders.

Special Orders have been approved relating to Dulverton, Somerset; parts of the rural districts of Crediton, St. Thomas, and Tiverton, Devon; the urban district of Wiveliscombe, and the rural district of Wellington, Somerset; the urban district of Withernsea and part of the rural district of Patrington, East Riding, Yorks.; the acquisition and use by the Mayor, Aldermen, and Councillors of the Metropolitan Borough of Stepney of lands for the extension of the generating station at Limehouse; the urban district of Rainford, Lancaster; the urban district of Bollington and part of the rural district of Macclesfield, Chester; parts of the rural districts of Chapel-en-le-Frith and Bakewell, Derby; and the parishes of Gretna and Dornock, Dumfries-shire.

### A Trade Facilities Loan.

On May 9th, Mr. T. KENNEDY asked the Financial Secretary to the Treasury whether the Shropshire, Worcestershire and Staffordshire Electric Power Company had been guaranteed a loan under the Trade Facilities Acts; if so, would he state the amount guaranteed; whether he was aware of the proposed sale of this undertaking to an American syndicate; and whether, in guaranteeing the loan any condition was laid down for the maintenance of British control over this company.

Mr. A. M. SAMUEL said that guarantees under the Trade Facilities Acts amounting to £770,000 had been given in respect of loans raised by the Power Company. He had seen references in the Press to the effect that an offer had been made, apparently by foreign interests, to purchase the ordinary share capital of the company. The answer to the last part of the question was in the negative.

Mr. KENNEDY asked if the Government would make representations to this company, in order to find out what had happened.

Mr. SAMUEL said that was not necessary. The control of a company or the nationality of its shareholders was not within the purpose of the Trade Facilities Acts. The object of those Acts was to facilitate the raising of capital to be used for purchasing plant and machinery in Great Britain, with a view to employment being given in the production of such plant and machinery. Guarantees could be given, and were given, under those Acts, to foreign Governments and foreign companies, provided that they spent the guaranteed loans on British goods.

### Electricity in Rural Areas.

On May 10th, Sir D. NEWTON asked the Minister of Transport if he was aware that difficulties had arisen in obtaining suitable sites for sub-stations required for the distribution of electricity in rural areas.

Col. ASHLEY said he was not aware that such difficulties had arisen, but if Sir D. Newton would give him particulars, he would ask the Electricity Commissioners to consider them. Special Orders could be made, if necessary, to authorise the compulsory acquisition of land for stations for generating, transforming, converting or distributing electricity.

### Royal Assent.

The Royal Assent has been given, by Commission, to the following Acts: Yorktown (Camberley) District Gas and Electricity, Pacific Cable Board, Leamington and Warwick Traction, Jarrow and South Shields Traction, Chatham and District Traction, Cheltenham and District Traction, Mexborough and Swinton Traction, Mansfield District Traction, Derbyshire and Nottinghamshire Electric Power, and London County Council (General Powers), &c.

### Coal Mines Regulations.

The Secretary for Mines announces that the 1928 edition of the annual volume of "Regulations and Orders relating to Mines under the Coal Mines Act, 1911," has been published by H.M. Stationery Office (price 1s. net, by post 1s. 4d.). The book contains all the Orders (including Regulations) of a general nature relating to mines under the Coal Mines Acts, which were in force on January 1st, 1929, including the general regulations as to the organisation and training of rescue workers made by the Board of Trade on December 10th, 1928. The book also contains lists of permitted explosives and approved types of safety lamps, safety-lamp glasses and breathing apparatus; and memoranda on the official tests for safety lamps, explosives and rescue apparatus. A list of recent Parliamentary and other official publications relating to the coal mining industry is printed in an appendix.

# Legal.

## The Gasfilled Lamp Patent.

The hearing of the application of the British Thomson-Houston Co., Ltd., for a five-year extension of its gasfilled lamp patent was resumed in the Chancery Division by Mr. Justice Luxmoore on May 8th.

Sir Duncan Kerly, K.C., referred to the position of the Nox Electric Co., which he represented. He said that his clients had a definite agreement with the B.T.H. Co. for a licence. The suggested terms of the licence now put forward entitling the Nox Co. to manufacture 100,000 gasfilled lamps annually was ridiculous. The number of these lamps manufactured last year was 17 millions, and it was doubling every five years. If an extension of five years was granted it would mean that 40 millions of the lamps would be manufactured. What was the good of offering the Nox Co. the opportunity of manufacturing 100,000 lamps? It would probably not pay to manufacture on that scale. The Nox Co. understood that it was to have a real commercial licence, and refused to accept the proffered terms.

Sir A. Colefax, K.C. (for the B.T.H. Co.) said that the total output of the Nox factory, according to the evidence, was 750,000 lamps a year. The offer of a licence to manufacture 100,000 gasfilled lamps, plus a 10 per cent. increase annually, was, in the circumstances, perfectly proper.

The Judge said that if the Nox Co. had a concluded agreement the question of specific performance would be a matter that would arise after the applicants got their extension, if it were granted.

Mr. John Gray, of the B.T.H. Co., stated, in reply to questions by counsel representing the opposition, that at an interview which he had with a representative of the Nox Co., it was fair to infer that the B.T.H. Co. would grant the Nox Co. a licence to manufacture, but he assumed that there would be negotiations as to the terms of the licence. He agreed that licences were only granted on condition that prices would be maintained. It was true that there was an increase in the output of gasfilled lamps during the war. The demand for high-power gasfilled lamps was partly increased by the shortage of carbons for arc lamps. There was an obvious advantage in the bigger gasfilled lamps, which were easy to manufacture and market. With regard to the smaller lamps he could not say that small gasfilled lamps gave more light than vacuum lamps of equal wattage, but the gas enabled the filament to be heated 300 or 400 degrees more than it was possible to heat the vacuum lamp filaments, and the result was a better and brighter light.

Mr. Corsellis, for the Kye Electric Co. and Tungstalite, Ltd., two of the objectors, suggested to witness that in 1914 the production of gasfilled lamps was 28,000, and of drawn wire lamps 9¼ millions, and in 1918 the figures had gone up to 1¾ million gasfilled lamps and 18¼ million drawn-wire lamps.

Mr. Gray replied that he did not think so. The B.T.H., the G.E.C., and Siemens accounted between them for 80 per cent. of the total sales of gasfilled lamps. They did not pay royalties to each other. He did not think that the amount received in royalties by the B.T.H. Co. totalled more than £150,000. Asked to explain the statement that if the patent was not prolonged the country would be flooded with foreign-made lamps, Mr. Gray said that if the foreigner found that he could get a higher price here than he got at home he would sell here to get that profit. The quality of his product did not matter because he was not concerned with establishing an industry here, but merely with getting a profit. It was not generally true that the prices of foreign lamps were lower than in this country. He did not agree that if the patent was not extended the prices of British lamps would come down. There had already been a reduction, and he did not believe that prices would get any lower.

In further cross examination on May 9th, Mr. Gray said that it was the policy of the sales department of his company to advocate the use of internally-frosted lamps, but he did not know that a preferential discount was being allowed on those lamps. He could not say whether it had been the company's policy to emphasise the gasfilled lamp during the past six years rather than the vacuum lamp, but he thought it quite natural that it should be so. He agreed that the sale of gasfilled lamps had greatly increased compared with vacuum lamps in recent years. Their improvements were now being directed to the gasfilled lamps, but they might make improvements in vacuum lamps.

Replying to Sir Arthur Colefax, Mr. Gray said that at his interview with the representative of the Nox Co. the question of the terms of the licence was not discussed at all. The Nox Co. was a new firm, and he considered the offer to it of a licence to manufacture 100,000 lamps a year with a 10 per cent. annual increase was fair. A 10 per cent. annual increase was usual in their licences.

Mr. Wilson, of the General Electric Co., Ltd., said that his company made a substantial proportion of the English lamp output. They paid as manufacturers no royalties to the B.T.H. Co. He had not the slightest doubt that the war was an impediment to the commercial manufacture of the gasfilled lamp.

This concluded the evidence for the applicants, and evidence of opposition witnesses was called.

Dr. Elkan Wechsler, representing Tungstalite, Ltd., said that that company was incorporated in 1923 with a nominal capital of £2,000, subsequently increased to £3,000. He and another gentleman of the same name owned more than half the shares. The company was formed to manufacture and deal in all kinds of electric lamps. They had a factory at Stoke Newington where they manufactured lamps, employing about 25 hands. Their output of incandescent electric lamps was about 1,000 a day, or a quarter of a million per annum. During the war he was employed at Pope's Electric Lamp Works.

Sir A. Colefax suggested to witness that Pope's did not manufacture gasfilled lamps during the war. Witness said his recollection was that they did. He was chemist there and made experimentally the first gasfilled lamp, he thought, about the end of 1918. Pope's having become licensees of the B.T.H. Co. in April, 1918. Pope's manufactured tungsten during the war and produced, he believed, drawn-wire tungsten filaments in 1916. Early in the war there was difficulty in getting tungsten wire, but it was available, from people at Hanwell, who supplied it in defiance of a patent.

Mr. B. Wechsler, also associated with Tungstalite, Ltd., said his experience was that 40-W and 60-W gasfilled lamps were not superior in lighting qualities to vacuum lamps, but were often inferior.

Mr. B. R. Agazar, representing the Kye Electric Co., Ltd., said he had been associated with a number of companies which dealt in imported lamps. Two of these companies had been proceeded against by the applicants for infringement of patent, and the relief sought was granted, and one of them, Kye, Ltd., was compulsorily wound up in 1928. The Kye Electric Co. was a fresh registration. It dealt entirely in lamps of its own manufacture. It had a factory in London and its output was now 30,000 lamps a week. Witness maintained that the demand for gasfilled lamps had been checked by the high prices. The cost price of gasfilled lamps was not more than that of vacuum lamps, yet during the war the average price of gasfilled lamps was 12s. 6d. against 4s. 3d., afterwards increased to 5s. for equivalent vacuum lamps. Abroad the cost of gasfilled lamps was less than that of vacuum lamps. He did not agree that gasfilled lamps were more durable than vacuum lamps. The cost of manufacture of a 200-V 60-W drawn-wire lamp to-day was about 5d.; it was sold at 1s. 11d. or 2s. Lamps could be imported from abroad at 4s. 8d. or 4s. 9d. a dozen.

Mr. Horace Woolridge, of the Nox Co., said that his company was incorporated in 1923 with a capital of £2,000, increased in 1927 to £15,000, all issued. Debentures for £12,000 or £13,000 were outstanding. The company had a factory in Leeds, where it manufactured not only lamps, but glass for the lamps. Their output was 750,000 lamps a year, which they expected to increase to a million next year. They employed over 200 persons. While the company considered that the terms of the licence offered them were generally fair and reasonable, they objected to the restriction of output to 100,000 per annum.

Sir A. Colefax said he should not contend that the Nox Co. was not a proper company to receive a licence.

Mr. Norman E. Paine, works manager of the Nelson Co., said that they had a factory in Merton Park, and their output of lamps varied from 3,000 to 11,000 a week. The company was incorporated in 1925, the authorised capital being £50,000.

This concluded the evidence.

Sir Duncan Kerly, for the Nox Co., said they were content to leave the matter of the limitation in the licence offered to them to further discussion, and he did not further oppose the extension of the patent.

The hearing was continued on May 13th, when Mr Corsellis, on behalf of Tungstalite, Ltd., and the Kye Electric Co., Ltd., contended that the patentees had not suffered loss owing to the war. That was proved by the figures which had been put forward. Mere figures of number of sales of lamps were of little value compared with the figures showing the actual receipts as indications of what profit or loss had come to the patentees owing to the war. During the war vacuum lamps increased from 10 millions in 1914 to 18 millions in 1918, and the gasfilled lamps from 28,000 to 1¾ millions.

The Judge said he did not think 1914 was a fair year for comparison. The patent was not in full working then. He had to consider whether the life of the patent had been interrupted by the war, and the evidence was that it was.

Counsel argued that the interruption by the war could only have been in the direction of the small lamps. The war increased the sales of large-sized gasfilled lamps. The question was, could the small lamps have been made if there had been no war?

The Judge pointed out that in 1919 the sales of gasfilled lamps were two millions, in 1920 four millions, and the sales had risen since to 17 millions.

Counsel said that every one of these patents took three or four years to get going. The evidence was that most of the sales since the war had been by the G.E.C. and Siemens, who did not pay royalties, and the figures which had been put forward of the sales of lamps were no criterion of what profits the patentees would have made. The only figures which mattered were those of the patentees' own sales and those in which they were interested from a royalty point of view. Those figures were not before the Court, but it was admittedly a small proportion of the whole. The B.T.H.

Co., by means of its gasfilled lamp patent, had been in effect prolonging its monopoly with regard to vacuum lamps, because those who wanted to sell any kind of vacuum lamp could not do so by reason of the conditions inserted in their contracts with the B.T.H. Further, the B.T.H., or the Association of which they were members, in contracts with municipal users had inserted in the printed contract conditions directly contrary to the penal section of the Patents Act, the conditions being that the user only got the advantage of certain discounts if he bought all his lamps from a particular company. Before any extension of the patent was granted that ought to be considered.

Mr. Shelley, for the Nelson Electric Co., said the evidence showed that there had been a considerable diminution in the price of gasfilled lamps in the period since the war, and that during the war the price was high and maintained at more or less the same level. Thus the increase in demand was materially improved by the decrease in price. Further, all the improvements relating to lamps had been in the gasfilled lamps, and that had also had an effect in stimulating demand. The patentees' experience during the war years was just the same as that of other patentees during the first few years of the working of a patent.

Mr. Stafford Crossman, for the Comptroller-General of Patents, said that the view of the Comptroller was that, if his Lordship thought there ought to be an extension of the patent, in all the circumstances, having regard to some extent to the sale by the applicants of imported lamps, any extension that his Lordship granted should not exceed two years. Further, any extension granted should be subject to an undertaking by the applicants that they would use their best endeavours to register all the licences mentioned in their affidavits. The greater number of the licences were not on the register.

Sir Arthur Colefax, K.C., in replying on behalf of the B.T.H., contended that, so far as the municipal contracts were concerned, those contracts were not with the applicants, but with the Electric Lamp Manufacturers' Association. There was no restriction on the user of lamps, and the conditions of the contracts merely were to give special conditions as to discount if the municipality undertook to purchase lamps only from members of the Association. He submitted that the contracts did not come within the scope of the section of the Act at all.

The hearing was concluded on May 14th. Sir Arthur Colefax continued his statement, and Mr. Justice Luxmoore gave his decision immediately afterwards. He said that he had come to the conclusion that two years was a proper period for extension. The patent would therefore be extended for that time and the applicants must endeavour to obtain the registration of licences forthwith. There was no order as to costs. A report of the judgment will appear in our next issue.

## Marconi Company's Royalties Appeal.

The hearing was resumed on May 8th of the appeal by Marconi's Wireless Telegraph Co., Ltd., from an order of the Comptroller-General of Patents in favour of the Brownie Wireless Co., Ltd., granting the latter a compulsory licence on special terms.

The Attorney-General (Sir T. Inskip, K.C.), on behalf of the Crown, said he did not desire to express an opinion on controversial matters; his duty was to help the Court in the interpretation of a difficult section of the Act of Parliament. The view he took was that it was quite clear that Parliament intended that a patentee should himself or indirectly put on the market the article in respect of which he had secured monopoly rights, and that he should work the patent not for his own selfish purposes only, but so as to secure to the public an advantage by reason of the discovery which he had made. The Act intended to prevent an abuse of patent rights. It would be clearly an abuse if there was a failure to work the patent on a commercial scale without good reason, or if foreigners were preferred by the patentee, or if there was an insufficiency of supply on reasonable terms. The Comptroller-General had suggested that there were a large number of people in the country who were unable to satisfy their desire to possess valve receiving sets because they could not afford to pay existing prices, that it was desirable that they should have sets, and that sets could be produced more cheaply if a wider licence was granted by the Marconi Co. on terms which would be to the advantage of the Marconi Co. and reasonable to the licencee. It was easy to come to the conclusion in all the circumstances that public interest required a compulsory licence to be granted. Then the applicant had to show that by reason of the refusal to grant a licence on reasonable terms his trade had been prejudiced. If his Lordship was satisfied that it was in the public interest that a licence should be granted, counsel suggested that his Lordship should attach great importance and respect to the views which the Comptroller-General had expressed on the matter. He (the Attorney-General) had no wish to express any opinion on the subject of the amount of the royalty. He merely suggested that if 12s. 6d. per valve holder was interfering with the widest possible use of the invention in this country, and with a lower royalty there could be a wider use of the invention consistently with a maximum advantage to the patentee and reasonable profit to the licencee, then the figure of 12s. 6d. was unreasonable. Public interest seemed to be the over-riding matter, it being clearly laid down by Parliament that the intention of the grant of the monopoly was not to enable ingenious manufacturers to make enormous profits at the expense of the public, but that in return for the monopoly rights they were to give the public the advantage of their discovery upon reasonable terms which would enable as many people as possible to enjoy it. The Attorney-General added that he did not say that wireless had yet become a necessity in our everyday life, but it might. With regard to the prohibition of exports clause in the licence, he thought it not unreasonable. If his Lordship came to the conclusion that for other reasons a licence should be granted, it would be, he considered, unreasonable for the patentee to insist on royalty being paid on unpatented articles.

Mr. Justice Luxmoore reserved judgment.

## Marconi's Wireless Telegraph Co., Ltd., v. Langham Radio.

In the Official Referee's Court on May 6th Sir Francis Newbolt, K.C., had before him an action brought by Marconi's Wireless Telegraph Co., Ltd., against Langham Radio, Regent Street, W., in which plaintiffs claimed a declaration that they were entitled to inspect the defendants' books and accounts relative to certain licences granted by the plaintiffs to defendants to ascertain the amounts due. The matter came before Mr. Justice McCardie in January, who sent it to the Referee as the defendants submitted to judgment.

Mr. Samuels, for the plaintiffs, said that the auditors found that there was due to the plaintiffs £11,066.

Mr. Gardiner, for the defendants, did not contest this, and the Official Referee entered judgment for plaintiffs for the amount stated with costs.

## An Overhead-lines Book Dispute.

A motion for an injunction to restrain the alleged infringement of the copyright in a book dealing with the design of overhead electrical transmission lines, published by Chapman and Hall, Ltd., came before Mr. Justice Romer in the Chancery Division last week, the defendants being Sir Isaac Pitman and Sons, Ltd.

Mr. McGillivray, for the latter, said he desired substantial time to answer the plaintiffs' evidence. It was a case that concerned a technical text-book, the material for which must be derived largely from common knowledge and common sources. He asked for the motion to be adjourned until next sittings.

Mr. Gray, for the plaintiffs, said that part publication of the book had taken place, and he wanted an injunction to restrain further publication. On February 19th complaints were made to the defendants that certain passages and illustrations in their book were similar to those in the plaintiffs' book, but their author denied that there had been any copying. His instructions were that the book was one volume of a work that was coming out in parts.

Mr. Gillivray said he would give an undertaking in the terms of the notice of motion if the motion was adjourned.

His Lordship thereupon said that the motion would be adjourned until the second motion day of next sittings.

## Sequel to a Fatal Shock.

In the Cardiff County Court on May 7th, Judge Thomas awarded £100 damages to Elizabeth Bale against Alice A. Jesseman. It was stated for the plaintiff that the defendant ran an electric wire from her house to a garage at the bottom of her garden. A child playing near the wire came into contact with it and called for assistance. The plaintiff's son, aged 16, went to the child's rescue and as a result received a shock which killed him. The Judge found that the insulation of the wire was perished and there had been negligence upon the part of the defendant. The latter's solicitor announced his intention of appealing against the decision.

## Another B.T.H. Patent Application.

The British Thomson-Houston Co., Ltd., announces that on June 11th an originating summons will come before Mr. Justice Luxmoore in the Chancery Division for directions as to hearing. The summons relates to an application for a five years' extension of Patent No. 14,892, dated June 27th, 1913, granted to the company for the invention of "Improvements in and relating to vacuum tubes." Particulars regarding opposition procedure appear in our advertisement pages.

## British Thomson-Houston Co., Ltd., Litigation.

The Zenith Electric Co., Ltd., Willesden Green, N.W.2, asks us to state that it has no connection whatever with the defendants in the case reported in our last issue under the above heading.

# Correspondence.

***Correspondents should forward their communications as early as possible.*** *No letter can be published unless we have the writer's name and address in our possession.*

## The Behaviour of Lead Cable Sheaths.

It is interesting to note that Mr. C. J. Beaver proposes a method to obviate the permanent distension of the lead, which was the very thing he set out to prove did not take place. The particulars of the cable under test in the notes published in the Electrical Review of March 1st last, page 370, are almost identical with those in Mr. Beaver's fig. 5, the mean diameter under the lead being 2.674 in., and mean thickness of the lead 0.154 in. May I explain that the permanent expansion of the samples under test was ascertained, not by measuring the diameter, as Mr. Beaver kindly suggests, but by the method of accurately weighing them when immersed in water at a known temperature, and the increase in diameter in mils was calculated in order that readers might the more readily compare the results obtained.

That Mr. Beaver does not find his deductions from the curve in fig. 3 agree with the expansion of fluid oils rather goes to show that some important factors were omitted from his calculations, possibly the "air content." The tests shown in figs. 4 and 5 were both taken on the same armoured cable. The armouring consisted of 69 galvanised soft-steel wires, each No. 9 s.w.g. As most super-voltage cables are wire armoured, the tests are the more practical for this reason, and it is surprising to find, with the large number of variables involved, that there was such close agreement between the results of the different tests we conducted. Mr. Beaver's cable sample was first put through a series of heat cycles, which must have generated internal pressure, and the sample, therefore, was not representative of a normally unloaded cable. His calculation of space content is then based on a normal pressure of 12 lb. (*i.e.*, already, say, 6 in. of vacuum). Surely as the first observed run after long preliminary treatment started at 15 lb., the air content should be calculated with that figure as a basis, and not the vacuum figure. Here I owe Mr. Beaver an apology, as the result will then be an air content of 0.056 cubic inch (the previous figure of 0.064 was incorrect) in place of his figure of 0.042 cubic inch. After all, it is quite evident that cables with small air content will be subjected to higher internal pressure than those with a greater air content.

**H. Gurney Wood.**

Woolwich, S.E.18, *May 6th*, 1929.

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In his original article on page 142, Mr. C. J. Beaver makes the following statement: "A certain amount of the cable impregnating medium is of necessity lost in making the end connections to the cable, and in order to make this good *with absolute certainty*, the pipe and its contents are put through a few daily cycles of heating and cooling. . . . This is repeated until *there is no doubt as to the cable being completely filled.*"

On page 735 in his second article he says: "In a degree, therefore, their conclusion" (that there was occluded air in the dielectric of his cable sample) "was a substantial part of my premises."

We find some difficulty in reconciling these two statements. If the precautions Mr. Beaver took to fill the cable sample completely were inadequate, and they apparently were, if he admits that there is still air there, then his test is not one of lead-sheath distension, but of residual air content. Under these circumstances we agree that it is possible to have an appreciable rise of temperature of the cable without permanent expansion of the sheath. That this is the real cause of the absence of permanent expansion in his experiment is shown, not only by his admission on page 735 quoted above, but also by his reference to dielectric compressibility. Since the cubic compressibility of either oils or cellulose is negligible, dielectric compressibility can only be due to its compressible gas content. His reference to absorption effects also supports the same view. "Absorption effects" is a vague term. There are no volume changes in such a mixture as that of cellulose and oil, and what the term really means is a movement of compound into a previously unoccupied space, or, rather, gas-occupied space.

How far it is possible to exclude all traces of air by any process of impregnation during manufacture, and how much harm they do if they remain are other and much larger questions which cannot be settled by discussion in the columns of your journal. It is sufficient to state here that the air can be reduced well below the 0.5 to 1.5 per cent. which Emanueli infers, by extrapolation of results of tests on impregnation after lead covering, must occur in usual cables.

There still remains the question whether sheath-distension effects occur in service. However uniform a cable is when it leaves the factory, and cable manufacturers do their utmost to make it so, there are always inevitable inequalities of treatment in service. There may be special local strains during installation, there are widely different ground conditions as regards heat dissipation, and there are differences of level. One example will suffice to illustrate our point. During the publication of the first of Mr. Beaver's articles, one of the writers received a letter from Mr. Roper, the well-known superintendent of the Street Department of the Commonwealth Edison Company, of Chicago, from which we are sure he will not mind our quoting. We trust Mr. Beaver will regard the evidence as impeccable.

"We are interested in the subject of the expansion of lead sheaths of cables which have oil-filled joints, as we have several thousands of such joints in service. Our records indicate in some cases that the voids within the cable are gradually being filled with oil, or that the entrained air is being displaced by the oil from the oil-filled joints; but we have been unable to discover by measurements of cables in service that there has been any increase in the diameter in sections of cable that were fairly level. As you know, hills in Chicago are pretty scarce, but we do have some tunnels under the river, and we have noted a gradual expansion of the lead sheath of a cable in a tunnel when the water in the tunnel was removed for work on other lines. This expansion finally developed a defect in the lead, and the cable was removed without any failure having occurred. When we tested the piece of cable to see how much damage had been done to it by the slight expansion of the sheath which we found, to our surprise we discovered it was the best piece of cable that we had ever tested. . . ."

What probably happened in the case Mr. Roper quotes is that there was a movement of compound during heating and cooling cycles towards the lowest part of the cable run. This section would tend to become fuller of compound than the remainder of the cable, and on heating, local pressures, sufficient to stretch the lead, would be developed before pressure equalisation could occur; the extra volume so created would be filled in again by settlement of the compound, leaving voids elsewhere, and further stretching would again occur. On removal, however, since this section was particularly full of compound, it would give an excellent power factor-voltage characteristic with no ionisation, and would therefore appear to be in excellent condition.

Whether this is the true explanation, or not, the fact still remains that here is a definite case of lead-sheath expansion occurring in service due to causes which could not be reproduced on a 6-foot experimental length.

We have in our possession reports of tests by another operating company which definitely prove that intermittent stretching of the lead sheaths of ordinary type cables fed from joint reservoirs takes place. These will no doubt be published in due course, but for the present the case quoted must suffice.

**T. N. Riley.**
**T. R. Scott.**

London, N.W.9, *May 6th*, 1929.

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## The Compulsory Earthing of Prepayment Meters.

How it must horrify some of these earthing cranks to enter a house and see all the 3-ampere tumbler switches with metal covers unearthed. Lead-covered wire, &c., should be earthed in case of fire, but, except in bathrooms, where the greatest care should be taken, why all this fuss about apparatus which *may* go wrong?

Why deliberately try to break down the insulation of kettles, irons, radiators, &c., by earthing them? It does not matter very much if somebody does get a slight tingle of 200 or 230 volts to earth once in 50 years. If such things are really dangerous owing to a large proportion of the population having heart, or some other serious complaint, then manufacturers should get rid of metal casing altogether from everything electrical.

The most dangerous thing in an all-electric, gas, or any other house is a kettle of boiling water, to say nothing of the usual tub of boiling water carefully left for the baby to fall into. The next is the usual gas geyser in the bathroom.

In nine cases out of ten a pre-payment meter may become "alive" and not even be discovered. In the tenth case, the lady of the house might receive a little shock, when she would probably give 1s. to "hubby" to put in the meter so that he could get one too. Soon somebody will discover that the lamp-holders on the ends of flexible wires and the iron bedsteads are not earthed.

**A. J. Abraham.**

Bexleyheath, *May 7th*, 1929.

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## Three-phase or Single-phase Lighting?

It would be interesting to have your readers' views on the proposed installation of a 3-phase to single-phase transformer for dealing with a large lighting installation.

It is claimed that, after including the transformer, a considerable saving would be shown on switchgear and sub-mains, on the conversion from 3-phase to single-phase. Faults occurring on the single-phase, four-wire system would automatically be distributed over the three phases on the two-wire system, and also one-third, or even two-thirds, of the load could be out of action without upsetting the supply company's balance.

It is proposed to install a static transformer, which will load each of the three incoming phases in the approximate

ratio of 1 : 1 : 2. Surely the supply companies concerned should not object, as the best they can hope for, especially on theatre installations, is a paper balance.

**H. J. Holmes.**

London, *May 6th*, 1929.

### Correspondence Schools.

"Ric" is unfair to the correspondence school in his article "An Old Problem—from a New Point of View." One or two of these schools guarantee to successfully coach students for the different institution examinations (such as A.M.I.E.E.), and to continue such coaching until the student passes. As these examinations are actually carried out under the eye of the particular institution concerned, surely it is something more than an "attempt to carry out the promise in their advertisements."

**W. H. Hunt.**

Northampton, *May 11th*, 1929.

# Published Specifications.

**Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.**

### 1927.

26,853. "Ignition systems, with coil, for internal-combustion motors." A. Petrella. October 8th, 1926. (278,759.)

27,790. "Television apparatus." J. L. Baird and Televisian, Ltd. October 19th, 1927. (309,965.)

28,138. "Luminous electrical discharge tube." R. W. James (Manhattan Electrical Supply Co., Inc.). October 22nd, 1927. (310,066.)

30,709. "Signalling installations." Siemens and Halske Akt. Ges. November 16th, 1926. (280,919.)

34,088. "Method and means for recording or reproducing sound." J. Neale. December 16th, 1927. (309,930.)

34,302. "Methods of guarding for overhead electric lines." W. Fennell. December 19th, 1927. (310,070.)

### 1928.

639. "Means for distributing electric current." Sykes & Dyson, Ltd., P. Sykes, and W. Cooper. August 11th, 1928. (310,096.)

1,316. "Synchronous motors." Electrical Research Products, Inc. April 6th, 1927. (288,236.)

1,405. "Thermionic valve circuits." A. F. Pollock and D. A. Pollock. January 16th, 1928. (309,846.)

1,427. "Multi-contact switches for telegraph or like systems." Automatic Telephone Manufacturing Co., Ltd., and W. J. Brown. January 16th, 1928. (309,847.)

1,430. "Lead-through insulators." J. E. Pollak (Hermsdorf-Schomburg-Isolatoren Ges.). January 16th, 1928 (309,884.)

1,681. "Systems for converting light energy into electrical energy, and *vice versa*." Electrical Research Products, Inc. April 6th, 1927. (288,237.)

1,553. "Electrical connectors or adaptors." F. D. Berners and L. Burns. January 17th, 1928. (309,890.)

1,570. "Arrangements for exciting commutator machines cascaded with asynchronous machines." Siemens-Schuckertwerke Akt. Ges. January 22nd, 1927. (283,957.)

1,620/1. "Electrical synchronising apparatus." T. W. Ross, C. Ryder, and Associated Electrical Industries, Ltd. January 17th, 1928. (309,897/8.)

1,636. "Electric lampholders." R. Nettle. January 18th, 1928. (310,078.)

1,693. "Lead-through insulators." J. E. Pollak (Hermsdorf-Schomburg-Isolatoren Ges.). January 18th, 1928. (309,936.)

1,711. "Sound recording and reproducing means." R. L. Aspden. January 18th, 1928. (310,079.)

1,712. "Controlling or preventing electrical interference with wireless installations due to the operation of electric motors." A. J. Haswell and Waygood-Otis, Ltd. January 18th, 1928. (309,939.)

1,717. "Means for generating alternating electric current with reciprocating engines as the driving power." Siemens-Schuckertwerke Akt. Ges. January 22nd, 1927. (283,961.)

1,745. "Television systems." Electrical Research Products, Inc. April 6th, 1927. (288,238.)

1,812. "Switching arrangement for zone time-metering in inter-urban telephonic connections chargeable at different rates." Soc. Anon. Hasler *cidevant* l'Atelier des Télégraphes de G. Hasler and M. Neu. January 19th, 1928. (310,081.)

1,820. "Indicating means for electric remote-control installations." Siemens and Halske Akt. Ges. January 20th, 1927. (Patent of addition not granted.) (283,935.)

1,847. "Television and like systems." Electrical Research Products, Inc. April 6th, 1927. (288,239.)

1,931. "Electric selective distant-control systems." G. Maurer. January 21st, 1927. (283,966.)

1,932. "Magneto-electric machines." R. B. North and A. Massey-Allen. January 20th, 1928. (310,083.)

1,934. "Thermionic valves and their method of application." Radio-technique. January 21st, 1927. (283,967.)

1,961. "Electric insulators." J. E. Pollak (Hermsdorf-Schomburg-Isolatoren Ges.). January 20th, 1928. (310,087.)

2,001. "Rotary stepping switches." Associated Telephone & Telegraph Co. March 7th, 1927. (286,638.)

2,017. "Television and like systems." Electrical Research Products, Inc. March 2nd, 1927. (286,262.)

2,901. "Electric heating resistance elements." General Electric Co., Ltd., A. Kinnes, and J. L. Rycroft January 30th, 1928. (310,102.)

3,002. "Protective covers for underground electric cables." G. Barnard and E. L. Cotterell. January 31st, 1928. (310,107.)

3,035. "Galvanic cell." G. Gaiser. January 31st, 1928. (Convention date not granted.) (284,626.)

3,126. "Electrotherapeutic appliances." N. Coe and A. Lithman. February 1st, 1928. (310,111.)

3,127. "Railway signalling devices." W. Gabbitas. February 1st, 1928. (310,112.)

3,648. "Headlights of automobiles." J. Bayley. September 3rd, 1928. (310,114.)

4,159. "Electronic discharge bulbs." Etablissements Gaiffe-Gallot et Pilon. December 7th, 1927. (301,855.)

4,645. "Systems for metering telephone calls." Telefonaktiebolaget L. M. Ericsson and E. A. Ericsson. February 14th, 1928. (301,120.)

5,340. "Sound reproducers for use in wireless telephony." R. O. Bridger. February 20th, 1928. (310,127.)

5,898. "Manufacture of electron-emitting bodies." Westinghouse Lamp Co. February 24th, 1927. (285,884.)

6,263. "High-voltage insulators." Associated Electrical Industries, Ltd. May 19th, 1927. (290,651.)

7,106. "Electric control apparatus." British Thomson-Houston Co., Ltd. March 16th, 1927. (287,136.)

7,758. "Electric protective devices." British Thomson-Houston Co., Ltd. March 19th, 1927. (287,454.)

8,335. "Lighting installations, comprising one or more discharge tubes having a high starting voltage." S. G. S. Dicker (Naamloose Vennootschap Philips' Gloeilampenfabrieken). March 19th, 1928. (310,154.)

8,898. "Ionisation chambers." Siemens-Reiniger-Viefa Ges für Medizinische Technik. September 8th, 1927. (296,769.)

10,730. "Arrangement for the automatic regulation of the degree of transmission of transmission systems, particularly of high-frequency transmission systems." Siemens & Halske Akt. Ges. May 26th, 1927. (Patent of addition not granted.) (291,083.)

11,320. "Sound-reproducing apparatus." C. Menkens. April 17th, 1928. (310,180.)

11,581. "Electrically-operated steel roller shutters and the like." S. Haskins & Bros., Ltd., and E. R. Watts. April 19th, 1928. (310,183.)

12,692. "Galvanic batteries." E. Wolff. January 28th, 1928. (305,009.)

12,964. "Portable electric power unit for use in dental surgery." J. M. Roig. May 19th, 1927. (290,974.)

13,135. "Indirectly-heated incandescent cathode for a vacuum tube." Dr. S. Loewe. May 4th, 1927. (289,860.)

13,281. "Electrical transformers and the like." M-L. Magneto Syndicate, Ltd., and R. H. Woodall. May 5th, 1928. (310,198.)

13,503. "Manufacture of electrical porcelain insulators." C. H. Thompson. May 8th, 1928. (310,201.)

14,489. "Direction indicator for motor vehicles." J. J. V. Armstrong (Spezial-Werk-zeng-Fabrik Feuerbach Ges.). May 17th, 1928. (310,208.)

15,549. "Ignition apparatus for internal-combustion engines." M-L. Magneto Syndicate, Ltd., and E. A. Watson. May 26th, 1928. (Cognate application, 26,414/28.) (310,216.)

16,312. "Electric insulators." P. Porzellanfabrik Rosenthal & Co. Akt. Ges. and W. Schmidt. June 5th, 1928. (310,222.)

17,284. "Electric heaters." E. N. Lightfoot. July 15th, 1927. (293,853.)

17,731. "Voltage-regulating systems." C. Coppock. June 19th, 1928. (310,229.)

18,658. "Non-metallic sheathed multiple-conductor cables." British Thomson-Houston Co., Ltd. Jun 28th, 1927. (292,983.)

21,181. "Induction measuring instruments." Landis & Gyr Soc. Anon. August 30th, 1927. (296,368.)

22,373. "Electrical switches." Rainsford & Lynes, Ltd., and R. K. Lynes. August 2nd 1928. (310,250.)

22,392. "Thermo-magnetic relays." International General Electric Co., Inc. August 5th, 1927. (295,039.)

23,532. "Electrically-driven household machines." Siemens-Schuckertwerke Akt. Ges. August 25th, 1927. (296,087.)

23,755. "Electric discharge devices." Westinghouse Lamp Co. September 8th, 1927. (296,778.)

26,885. "Electric remote-control systems." Associated Telephone and Telegraph Co. October 8th, 1927. (298,470.)

31,664. "Electrical teaching device." A. Huber. November 7th, 1927. (300,175.)

31,677. "Magneto-electric machines." E. Morel. November 9th, 1927. (300,240.)

31,889. "Railway signalling devices." W. Gabbitas. February 1st, 1928. (Divided application on 310,112.) (310,277.)

33,473. "Electric discharge devices." British Thomson-Houston Co., Ltd. November 16th, 1927. (300,614.)

34,212. "Sparking plugs." Siemens & Halske Akt. Ges. March 27th, 1928. (Addition to 302,893.) (308,708.)

35,337. "Television and like electro-optical transmission systems." Electrical Research Products, Inc. April 6th, 1927. (Divided application on (288,239.) (301,474.)

### 1929.

5,646. "Insulating materials." W. E. Beatty (Bell Telephone Laboratories, Inc.). December 15th, 1927. (Divided application on 307,966.) (309,851.)

# Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from May 8th :—

Eloden. No. 499,542. Class 8. Fitted electric switchboards, wireless telephonic and telegraphic apparatus and parts thereof, etc.—Eloden Muller and Co., Berlin. (British representatives: W. H. Beck & Co., 26-28, Holborn Viaduct, E.C.1.)

Symphonista, No. 499,635, Symphonion, No. 499,636, and Symphonetta, No. 499,831. Class 8. Radio-telephonic apparatus and parts thereof.—Dulcetto-Polyphon, Ltd., 2 and 3, Newman Street, W.1.

Bulldog's Head (design only). No. 499,962. Class 8. Primary and secondary electric batteries.—A.F.A. Accumulators, Ltd., 9a, Diana Place, Euston Road, N.W.1

Procell. No. 500,896. Class 8. Electric cables.—Mersey Cable Works, Ltd., Linacre Lane, Bootle, Liverpool.

Tunganite. Nos. 501,329 and 501,330. Classes 8 and 11. Electric accumulators (not for medical purposes). No. 501,331. Class 13. Accumulator boxes of lead.—Walter Haddon, 132, Salisbury Square, E.C.4.

### An Irish Allegory.

The 1929 summer exhibition of pictures at the Royal Academy contains some splendid examples of British art. The nearest approach to a problem picture is Mr. John Keating's "Night's Candles Are Burnt Out," which is of the nature of an allegory, apparently concerned with the past, present, and future of the Irish Free State. A skeleton hanging on the left, workmen resting or putting up lamps to light the dusk, a gunman humbly saluting a proud and obese engineer, a mother showing her child vast building operations across a valley, and a priest in the corner reading his breviary by the light of a candle: what does it all mean? According to J. M. N. J., presumably it means in the new Ireland disorder crumbling, the gunman yielding to the arts of peace, the Shannon electricity scene in the background, and the priest, contented at last, able to read his private prayers.

# New Work for Contractors.

**Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.**

***Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.***

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ALDERSHOT.—Cinema, High Street, for the Empire (Aldershot), Ltd. secretary.

ANNAN.—School, for Dumfries-shire E.C.; J. R. Hill, architect, Education Offices, Dumfries.

ASHTON-UNDER-LYNE.—Housing scheme (92), for the T.C. J. Rowbottom, borough surveyor (returnable deposit of £2 2s.).

AYLESFORD (MAIDSTONE).—Central school, for Kent E.C.; director of education, Sessions House, Maidstone.

AYR.—County buildings (£100,000); county clerk.

BEESTON.—Two schools, Lenton Abbey site (£45,650): Notts. Education Committee.

BIRMINGHAM.—Extensions, salvage depôt, Rotten Park Street (£125,000); city engineer. Two schools, Court Farm estate and Allen's estate; Education Committee.

BLACKPOOL.—Additions to Winter Gardens buildings; general manager. Municipal aerodrome; borough surveyor.

BOLTON.—Housing scheme (58), off Hulton Lane, for T.C. (deposit £2 2s.); Housing Department, 51, Victoria Square.

BOOTLE.—Housing scheme (122), Northfield Road (deposit £2 2s.); borough engineer, Town Hall.

BURNLEY.—Housing scheme, Barden Lane; borough surveyor.

BURTON-ON-TRENT.—Housing scheme, Clarence Road brewery site; borough engineer.

BURY (LANCS.).—Re-erection of portion of Gigg Mills, for the Bury Papermaking Co., Ltd. (£70,000).

BUTE.—Infectious diseases hospital at Lamlash, Arran (£9,000); medical officer, Arran.

CAMBUSLANG.—School, Dalton, for Lanarkshire E.C. (£20,000); director of education, Glasgow.

CARLTON.—Central school (400 places); Notts. Education Committee.

CHERTSEY.—50 houses at Victory Park, for U.D.C. (£18,636); contractor: A. E. Jones, Chertsey Road, Woking.

CHESHIRE.—Mental Institution, Grange Hall estate; Cheshire Joint Board for Mental Defectives.

COLCHESTER.—Additional 133 houses, for the T.C.; borough surveyor.

COULSDON AND PURLEY.—Public offices (£24,000), for the U.D.C.; surveyor. Secondary school, Coulsdon Court estate; Surrey county architect.

COVENTRY.—Factory, Canley, for the Coventry Plating and Presswork Co., Ltd.

CRICKLADE AND WOOTTON BASSETT.—Housing scheme (46), for the R.D.C.; R. C. Hawkes, clerk, High Street, Wootton Bassett (returnable deposit of £2 2s.).

DAGENHAM.—Secondary school, for Essex E.C.; director of education, Chelmsford.

DARLINGTON.—New St. Matthew's Church (£8,000); R. N. Stoddart, vicar.

DARTFORD.—Laboratories, Temple Hill; Burroughs, Wellcome & Co.

DATCHET.—Power station, for the Southern Railway Co., Ltd.; engineer.

DUDLEY.—564 houses, Priory estate (£229,542); Suburban Homes, Birmingham. 73 houses, Bowling Green estate; Messrs. Griffiths.

DUMFRIES.—Town hall buildings, for the T.C.; Mr. Barker, burgh surveyor.

DUNDEE.—Girls' school; clerk, Education Authority.

EASTLEIGH AND BISHOPSTOKE.—Additional housing scheme (260), for the U.D.C.; surveyor.

EDINBURGH.—Reconstruction scheme at University (£60,000); the Chancellor.

GALASHIELS.—Re-erection of Whitelee House, residence of Mr. Alexander Wyllie (£8,000).

GLASGOW.—Municipal maternity hospital; city architect. School, Springfield Road; W. J. B. Wright, architect, 1, Blythswood Square. Housing scheme, Quarrybrae Street; city engineer.

HALESOWEN.—Additional 200 houses, for the U.D.C.; surveyor.

HITCHIN.—Extensions, boys' grammar school (£34,000); governors.

ILKESTON.—Alterations, factory, Primrose Hill; W. Beardesley & Sons, Ltd.

LARGS.—Concert hall, for Town Council (£7,000); town clerk.

LEAMINGTON.—57 houses, Rushmore Farm estate; A. Ward, Coventry.

LEOMINSTER.—Extensions, cottage hospital; J. Budd and Sons, architects.

LIVERPOOL.—Cinema in Scotland Road, for W. L. Hampson.

LONDON (EAST HAM, E.).—Municipal offices, Barking Road site; borough engineer. Additions, East Ham Hospital, Shrewsbury Road; Clemens Bros., Ltd.

(WHITECHAPEL, E.).—Bank, Commercial Street and Brushfield Street (£15,000); Barclay's Bank, Ltd.

(BERMONDSEY, S.E.).—Warehouse, 55-7, Tanner Street; H. W. Wagstaff.

(LAMBETH, S.E.).—Extensions, School of Printing (£33,000); L.C.C. architect.

(SYDENHAM, S.E.)—Shops and flats, West Hill; North, Robin & Wilsdon, architects.

(WANDSWORTH, S.W.).—Warehouse premises, for Lighting Trades, Ltd.; J. Oran & Son.

(WEST KENSINGTON, W.).—Four-storey premises, West Kensington Gardens, for Olympia, Ltd.; James Carmichael (Contractors), Ltd., builders.

LUTON.—Extensions, Borough Engineering Works, Ltd. School, Denbigh Road (600 places), for the borough E.C.; W. Smith, clerk.

MACCLESFIELD.—Works, Lower Heyes Mill, for the Viscose Paper Co.; City and Continental Trust, Ltd.

NORTHAMPTON.—Factory, Abbey Street; E. W. Hasdell. 11 shops and 27 houses, Wellingborough Road; Manfield and Sons, Ltd. Housing scheme (49), for the T.C.; A. Fidler, borough engineer (returnable deposit of £5).

NORTHERN IRELAND (BELFAST).—Flour mill, for J. Rank, Ltd., millers. Elementary school in Blythe Street, for E.C. (£31,000).

OLDHAM.—Housing scheme (300), Limeside (deposit £2 2s.); borough engineer.

OLLERTON.—Further housing scheme; Butterley Colliery Co.

RICKMANSWORTH.—Housing scheme (58), for the U.D.C.; surveyor (returnable deposit of £2).

ST. ALBANS.—Mental hospital; J. M. Sheppard, architect for Herts. C.C.

ST. AUSTELL.—Girls' secondary school (£15,000), for Cornwall E.C.; F. R. Pascoe, secretary, Truro.

SEDGEFIELD.—Housing scheme (56), for the R.D.C.; surveyor.

SOUTHPORT.—Extensions, Southport Convalescent Hospital; secretary.

SOUTH SHIELDS.—158 houses, Marsdon Lane, Harton, for H. Brown & Sons; T. A. Page & Son, architects. School (800 places) housing estate; R. H. Morton, architect.

SOUTHWELL.—School (300 places); Notts. Education Committee.

STOCKPORT.—Cinema, Mersey Square, for S. G. Owens, The Willows, Hibbert Lane, Marple; W. Thornley, architect. Senior school, Great Moor, for the borough E.C.; director of education. Houses (90), for the T.C.; T. Davies & Son, builders.

STRETFORD.—118 houses, Barton estate; Grinshaw and Thomas. 146 houses, Barton estate; C. R. Bradley, Stacksteads.

SUNNINGHILL.—Central post office, for H.M. Office of Works, King Charles Street, London, S.W.

TROWBRIDGE.—Shops and offices, for the West Wilts. Electric Light and Power Co., Ltd.; W. W. Snailum, architect, Church Street.

WALSALL.—School, Ida Road (£28,500), for the borough E.C.; borough surveyor.

WATFORD.—Extensions, nursing home (£10,000); Herts. C.C.

WEST BRIDGFORD.—Secondary school; Notts. Education Committee.

WINCHCOMBE.—Electric lighting installation, Parish Church; vicar.

WINDSOR.—Hall, girls' county school, for Berks. E.C.; director of Education, Reading.

YORK.—Extensions, fever hospital (deposit £2); F. W. Spurr, city engineer.